United States
Department of
Agriculture

Soil
Conservation
Service

In cooperation with
Illinois Agricultural
Experiment Station

Soil Survey of Effingham County, Illinois

How To Use This Soil Survey

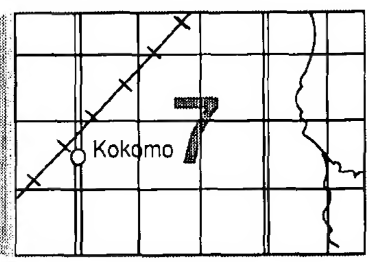
General Soil Map

The general soil map, which is the color map preceding the detailed soil maps, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the color-coded map legend, then refer to the section **General Soil Map Units** for a general description of the soils in your area.

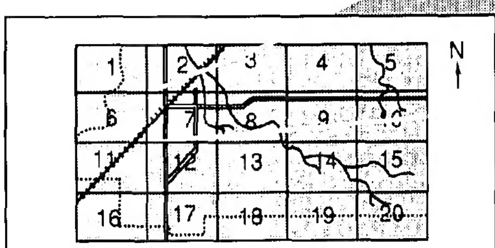
Detailed Soil Maps

The detailed soil maps follow the general soil map. These maps can be useful in planning the use and management of small areas.



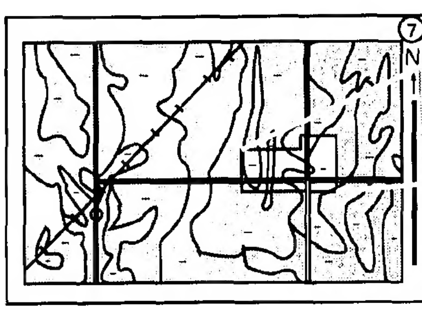
MAP SHEET

To find information about your area of interest, locate that area on the **Index to Map Sheets**, which precedes the soil maps. Note the number of the map sheet, and turn to that sheet.

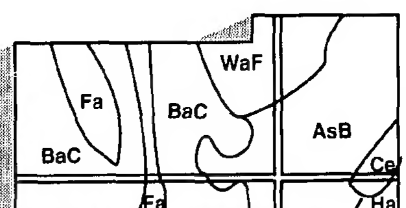


INDEX TO MAP SHEETS

Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Index to Map Units** (see Contents), which lists the map units by symbol and name and shows the page where each map unit is described.



MAP SHEET



AREA OF INTEREST

NOTE: Map unit symbols in a soil survey may consist only of numbers or letters, or they may be a combination of numbers and letters.

The **Summary of Tables** shows which table has data on a specific land use for each detailed soil map unit. See **Contents** for sections of this publication that may address your specific needs.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1985. Soil names and descriptions were approved in March 1986. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1985. This survey was made cooperatively by the Soil Conservation Service and the Illinois Agricultural Experiment Station. It is part of the technical assistance furnished to the Effingham County Soil and Water Conservation District. The cost was shared by the Effingham County Board and the Illinois Department of Agriculture.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

This soil survey is Illinois Agricultural Experiment Station Soil Report No. 133.

All programs and services of the Soil Conservation Service are offered on a nondiscriminatory basis, without regard to race, color, national origin, religion, sex, age, marital status, or handicap.

Cover: Holton and Wirt soils on moderately wide flood plains. These soils are well suited to crop production. Hickory soils are the dominant soils on the adjacent wooded side slopes.

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Issued June 1991

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Foreword

This soil survey contains information that can be used in land-planning programs in Effingham County. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow over bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

John J. Eckes
State Conservationist
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Soil Survey of
Effingham County, Illinois

By Fred L. Awalt, Soil Conservation Service

Soils surveyed by Fred L. Awalt and Laurie L. King, Soil Conservation Service, and Michael B. Littleton, Effingham County

United States Department of Agriculture, Soil Conservation Service, in cooperation with the Illinois Agricultural Experiment Station

EFFINGHAM COUNTY is in the south-central part of Illinois (fig. 1). It has an area of 309,120 acres, or about 483 square miles. It is bordered on the north by Shelby and Cumberland Counties, on the east by Jasper County, on the south by Clay and Fayette Counties, and on the west by Fayette County. In 1980, the population of the county was 30,944. Effingham, the county seat, had a population of 11,270 *(19)*.

Missionaries came to the survey area in 1814. About 50 percent of the county was then covered with tall prairie grasses. Pioneers from Tennessee and Ohio settled in the timber stands along the streams. The wooded ridges provided dry land, and the streams were a source of water *(14)*. Effingham County was established in 1831 *(24)*.

Farming has always been the major enterprise in the county. Currently, farm-related service industries, a printing company, and a manufacturer of air-conditioners also provide employment opportunities.

This soil survey updates the survey of Effingham County published in 1931 *(13)*. It provides more recent interpretations than the older survey and has larger maps, which show the soils in greater detail.

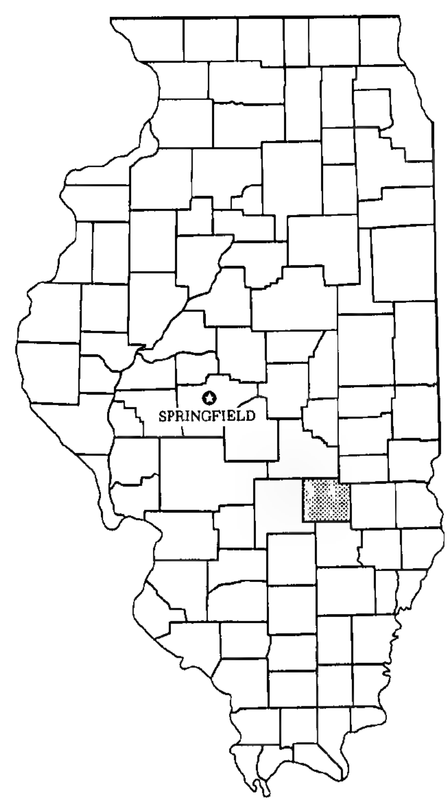

Figure 1.—Location of Effingham County in Illinois.

General Nature of the County

The following paragraphs provide general information about Effingham County. They describe natural resources; physiography, relief, and drainage; transportation facilities; and climate.

Natural Resources

Soil is the chief natural resource in Effingham County. The county had 1,293 farms in 1980 *(9)*. Corn, soybeans, and wheat are the major crops. Dairying and confinement hog operations are the main livestock enterprises. In most nearly level and gently sloping areas, the soils formed in medium textured material. Because of a favorable climate and favorable soil features, the farmland in these areas is productive.

Other natural resources in the county include sand, shale, and limestone; oil and coal; timber; and water. Small areas of sand deposits are along the east side of the Little Wabash River. One sand pit was in operation in 1981. It provided material mainly for paving. Deposits of clayey shale suitable for the manufacture of drainage tile are available in the county *(21)*. The limestone deposits are thin *(7)*. Currently, the county has no active shale or limestone mines. It has more than 54,500 acres of woodland *(8)*.

The county produced 263,667 barrels of crude oil in 1979 *(20)*. The first oil wells were brought into production in 1940 *(12)*.

Most of the county is underlain by bituminus coal. The thickest deposits are in the eastern and northern parts. The county has an estimated 980 million tons of coal reserves, but it has no active coal mines *(1)*.

Drinking water is supplied by reservoirs, by shallow wells, and by dams in the streams. The Altamont Reservoir, southeast of Altamont, and Lake Sara, west of Effingham, provide drinking water. The lakes that supply drinking water also provide opportunities for water sports. Ground water is available in areas of valley fill along the larger streams. The drinking water for most rural homes is supplied by low-yielding wells or is hauled from nearby communities. The county has essentially no sizable bedrock aquifers. Numerous farm ponds provide water for livestock.

Physiography, Relief, and Drainage

Effingham County is in the Springfield Plain region. Thin or moderately thick glacial drift was deposited on this plain during the Illinoian stage of glaciation. The entire county was once covered with loess deposits, which currently range from 0 to 50 inches in thickness. More than 50 percent of the county occurs as a large, nearly level till plain dissected by gently sloping, shallow drainageways. A few low-relief ridges may be remnants of old moraines. These ridges are not continuous on the landscape. Bedrock is near the surface in a few areas where streams have cut deeply into the till plain.

The county has relatively low relief. Elevation ranges from 470 feet above sea level in an area in the southern part where the Little Wabash River leaves the county to 681 feet on some of the low-relief ridges. The elevation of the till plain ranges from 530 feet to 640 feet.

The drainage pattern in the county is essentially to the south. The county is bisected by the Little Wabash River. This stream and its tributaries drain about three-quarters of the county. Water in the northwestern part of the county drains westward into the Kaskaskia drainage system.

Transportation Facilities

The county generally has good transportation facilities. It is crossed from north to south by Interstate Highway 57, U.S. Highway 45, and State Routes 32, 37, and 128 and from east to west by Interstate 70, U.S. Highway 40, and State Route 33. Most of these highways pass through the city of Effingham. The county also has a good system of secondary rural blacktop roads. Railroads provide valuable transportation service, including passenger service in Effingham. A municipal airport is south of Effingham.

Climate

Prepared by the Illinois State Water Survey, Champaign, Illinois.

Effingham County is cold in winter and hot in summer. Winter precipitation, frequently snow, results in a good accumulation of soil moisture by spring. It minimizes summer drought on most soils, although drought does occur in some years. The normal annual precipitation is adequate for the crops that are suited to the temperature and growing season in the county.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Effingham in the period 1951 to 1980. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In January, the average temperature is 27.3 degrees F and the average daily minimum temperature is 18.3 degrees. The lowest temperature on record, which occurred at Effingham on February 2, 1951, is -17 degrees. In summer, the average temperature is 74.9 degrees and the average daily maximum temperature is 86.8 degrees. The highest recorded temperature, which occurred at Effingham on July 14, 1954, is 111 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the

average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is 37.81 inches. Of this, 21.97 inches, or 58 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 12.38 inches. The heaviest 1-day rainfall during the period of record was 5.66 inches.

The average seasonal snowfall is about 21 inches. The greatest snow depth at any one time during the period of record was 16 inches.

How This Survey Was Made

This survey was made to provide information about the soils in the survey area. The information includes a description of the soils and their location and a discussion of the suitability, limitations, and management of the soils for specified uses. Soil scientists observed the steepness, length, and shape of slopes; the general pattern of drainage; the kinds of crops and native plants growing on the soils; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils in the survey area occur in an orderly pattern that is related to the geology, the landforms, relief, climate, and the natural vegetation of the area. Each kind of soil is associated with a particular kind of landscape or with a segment of the landscape. By observing the soils in the survey area and relating their position to specific segments of the landscape, a soil scientist develops a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. The system of taxonomic classification used in the United States is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot assure that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they

drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Map Unit Composition

A map unit delineation on a soil map represents an area dominated by one major kind of soil or an area dominated by several kinds of soil. A map unit is identified and named according to the taxonomic classification of the dominant soil or soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural objects. In common with other natural objects, they have a characteristic variability in their properties. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of soils of other taxonomic classes. Consequently, every map unit is made up of the soil or soils for which it is named and some soils that belong to other taxonomic classes. These latter soils are called inclusions or included soils.

Most inclusions have properties and behavioral patterns similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting (similar) inclusions. They may or may not be mentioned in the map unit descriptions. Other inclusions, however, have properties and behavior divergent enough to affect use or require different management. These are contrasting (dissimilar) inclusions. They generally occupy small areas and cannot be shown separately on the soil maps because of the scale used in mapping. The inclusions of contrasting soils are mentioned in the map unit descriptions. A few inclusions may not have been observed and consequently are not mentioned in the descriptions, especially where the soil pattern was so complex that it was impractical to make enough observations to identify all of the kinds of soil on the landscape.

The presence of inclusions in a map unit in no way diminishes the usefulness or accuracy of the soil data. The objective of soil mapping is not to delineate pure taxonomic classes of soils but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but onsite investigation is needed to plan for intensive uses in small areas.

General Soil Map Units

The general soil map at the back of this publication shows the soil associations in this survey area. Each association has a distinctive pattern of soils, relief, and drainage. Each is a unique natural landscape. Typically, an association consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one association can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one association differ from place to place in slope, depth, drainage, and other characteristics that affect management.

Soil Descriptions

1. Cisne-Hoyleton-Newberry Association

Nearly level and gently sloping, poorly drained and somewhat poorly drained, very slowly permeable and slowly permeable, silty soils formed in loess and loamy sediments; on uplands

This association consists of soils on broad loess-covered till plains. The loess is dominantly 3 or 4 feet thick. Shallow depressions and low ridges and knolls are in scattered areas throughout the association. Most areas are drained by ditches and drainageways. Slopes range from 0 to 7 percent.

This association makes up about 50 percent of the county. It is about 49 percent Cisne soils, 20 percent Hoyleton soils, 15 percent Newberry soils, and 16 percent minor soils (fig. 2).

Cisne soils are nearly level and poorly drained and have a very slowly permeable subsoil. They are on broad plains. Typically, the surface layer is very dark grayish brown, friable silt loam about 8 inches thick. The subsurface layer is light brownish gray, friable silt loam about 8 inches thick. The subsoil extends to a depth of more than 60 inches. It is mottled and firm. The upper part is grayish brown silty clay loam. The lower part is dark grayish brown clay loam.

Hoyleton soils are nearly level and gently sloping and are somewhat poorly drained. They are on low broad ridges, side slopes, and knolls. Typically, the surface layer is very dark grayish brown, friable silt loam about 9 inches thick. The subsurface layer is dark brown, friable silt loam about 4 inches thick. The subsoil is about 39 inches thick. It is mottled. The upper part is dark yellowish brown and grayish brown, firm silty clay loam. The next part is dark brown and brown, firm silty clay loam. The lower part is dark brown, very firm loam. The underlying material to a depth of 60 inches or more is yellowish brown, mottled, very firm loam.

Newberry soils are nearly level and poorly drained. They are on broad plains and in wide, shallow depressions. Typically, the surface layer is very dark grayish brown, friable silt loam about 8 inches thick. The subsurface layer is dark grayish brown, mottled, friable silt loam about 10 inches thick. The next 5 inches is light brownish gray, mottled, firm silty clay loam. The subsoil to a depth of more than 60 inches is mottled, firm silty clay loam. The upper part is light brownish gray. The next part is gray. The lower part is grayish brown.

Of minor extent in this association are the Darmstadt, Ebbert, and Huey soils. The somewhat poorly drained Darmstadt and poorly drained Huey soils have a high content of sodium in the subsoil. They commonly can be identified on the landscape as areas where the surface soil is lighter colored. The poorly drained Ebbert soils are in small depressions.

The major soils are used mainly for cultivated crops or for pasture. The Cisne soils are moderately suited to cultivated crops, and the Hoyleton and Newberry soils are well suited. The seasonal high water table and the hazard of water erosion are management concerns. All of the major soils are well suited to pasture. The

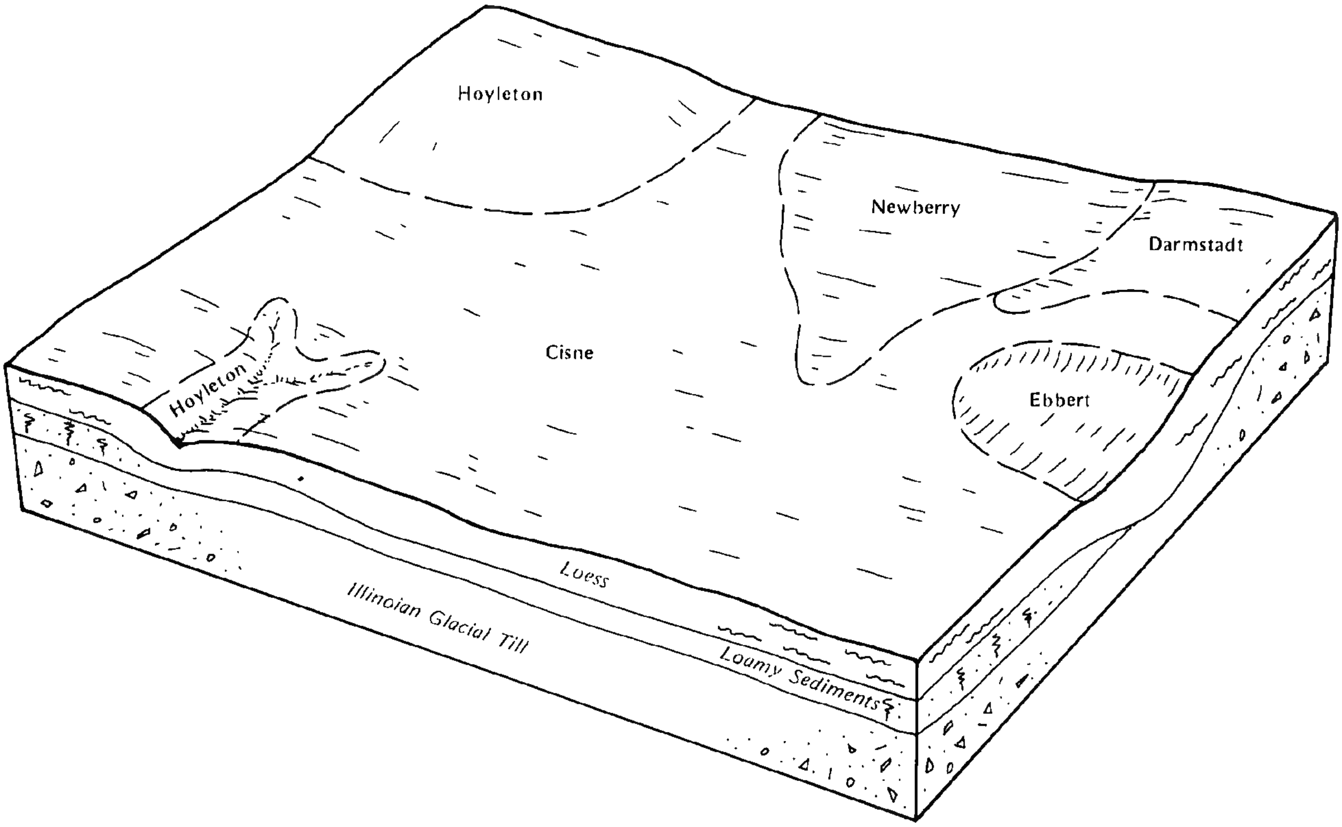

Figure 2.—Pattern of soils and parent material in the Cisne-Hoyleton-Newberry association.

seasonal high water table is a limitation.

The major soils generally are poorly suited to dwellings and septic tank absorption fields. The seasonal high water table, the very slow or slow permeability, and the shrink-swell potential are limitations affecting these uses.

2. Bluford-Hickory-Ava Association

Nearly level to steep, well drained to somewhat poorly drained, moderately permeable to very slowly permeable, silty and loamy soils formed in loess and loamy sediments or in glacial till; on uplands

This association consists of soils on gently sloping ridges, nearly level flats, and strongly sloping to steep side slopes along drainageways. Narrow bottom land is included in the association. Most areas are drained by small creeks and drainageways. Slopes range from 0 to 50 percent.

This association makes up about 41 percent of the county. It is about 31 percent Bluford soils, 28 percent Hickory soils, 23 percent Ava soils, and 18 percent minor soils (fig. 3).

Bluford soils are nearly level and gently sloping, are somewhat poorly drained, and have a slowly permeable subsoil. They formed in loess and loamy sediments. Typically, the surface layer is dark brown silt loam about 9 inches thick. The subsurface layer is pale brown, friable silt loam about 3 inches thick. The next 7 inches is brown, mottled, firm silty clay loam. The subsoil extends to a depth of more than 60 inches. It is firm and mottled. The upper part is brown silty clay. The next part is brown silty clay loam. The lower part is light brownish gray silty clay loam and loam.

Hickory soils are strongly sloping to steep and are well drained. They formed in glacial till. Typically, the surface layer is dark grayish brown, friable loam or silt loam about 2 inches thick. The subsurface layer is brown, friable loam about 7 inches thick. The subsoil is about 43 inches thick. The upper part is yellowish brown, firm clay loam. The lower part is yellowish brown and brown, firm gravelly clay loam. The underlying

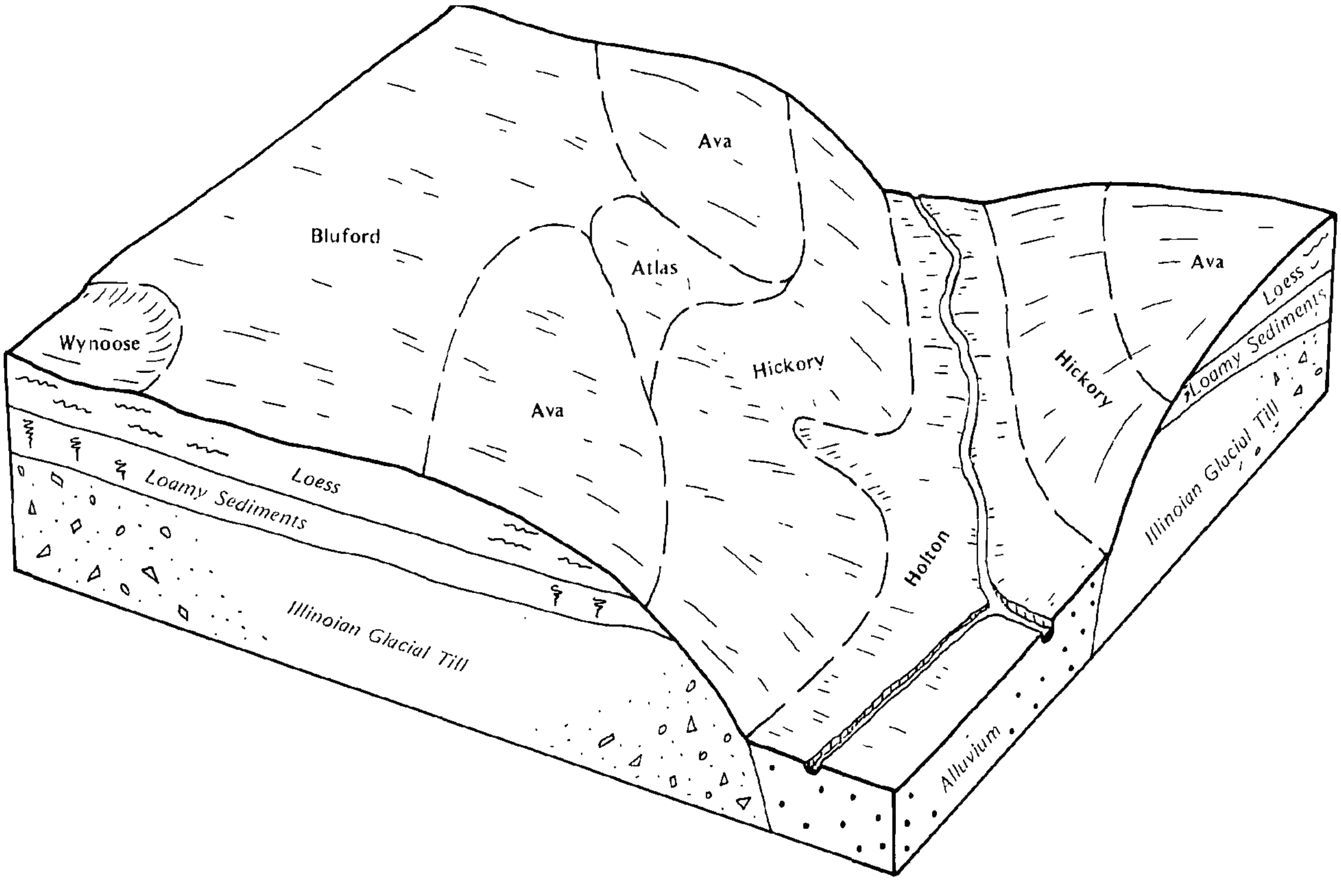

Figure 3.—Pattern of soils and parent material in the Bluford-Hickory-Ava association.

material to a depth of 60 inches or more is brown, firm gravelly clay loam.

Ava soils are gently sloping and moderately sloping and are moderately well drained. They formed in loess and loamy sediments. Typically, the surface layer is dark grayish brown silt loam about 9 inches thick. The subsurface layer is dark yellowish brown, mottled, friable silt loam about 6 inches thick. The subsoil extends to a depth of more than 60 inches. It is mottled. The upper part is yellowish brown, friable silty clay loam. The next part is pale brown and brown, firm silty clay loam. The lower part is grayish brown, very firm silty clay loam and silt loam.

Of minor extent in this association are the Atlas, Holton, Parke, and Wynoose soils. The moderately sloping, somewhat poorly drained Atlas soils are on side slopes along drainageways. The nearly level, somewhat poorly drained Holton soils are on bottom land. The gently sloping and moderately sloping, well drained Parke soils are on ridges and knolls above the major soils. The nearly level, poorly drained Wynoose soils are on broad flats below the Bluford soils.

The major soils are used mainly for cultivated crops, pasture, or woodland. The Bluford soils and the gently sloping Ava soils are well suited to cultivated crops. All of the major soils, except for the steep Hickory soils, are suited to pasture. The soils generally are well suited to woodland. In the areas used for cultivated crops or pasture, water erosion is a hazard and the seasonal high water table is a limitation. The slope and the hazard of water erosion are concerns in managing woodland. The association provides a diverse habitat for wildlife.

The steep Hickory soils generally are unsuited to dwellings and septic tank absorption fields because of the slope. The Bluford soils are poorly suited to these uses because of the seasonal high water table and slow permeability. The Ava soils and the strongly sloping

Hickory soils are moderately suited to dwellings. The shrink-swell potential and the slope are limitations. The seasonal water table and restricted permeability in the Ava soils and the slope of the Hickory soils are limitations on sites for septic tank absorption fields.

3. Holton-Wirt Association

Nearly level, somewhat poorly drained and well drained, moderately permeable to rapidly permeable, silty and loamy soils formed in loamy and sandy alluvium; on bottom land

This association consists of soils on the frequently flooded bottom land along the major streams and tributaries in the county. Slope ranges from 0 to 2 percent.

This association makes up about 9 percent of the county. It is about 70 percent Holton soils, 17 percent Wirt soils, and 13 percent minor soils.

Holton soils are somewhat poorly drained. They are frequently flooded for brief periods from January through June in most years. Typically, the surface layer is dark grayish brown, mottled, friable silt loam about 10 inches thick. The subsoil is about 26 inches thick. The upper part is dark grayish brown, friable sandy loam. The lower part is dark grayish brown and grayish brown, mottled, friable loam and silt loam. The underlying material to a depth of 60 inches or more is dark gray, mottled loam.

Wirt soils are well drained. They are frequently flooded for very brief periods from March through May in most years. Typically, the surface layer is dark brown, friable loam about 8 inches thick. The underlying material extends to a depth of more than 60 inches. The upper part is dark brown and brown silt loam and fine sandy loam. The lower part is brown loam and loamy sand.

Of minor extent in this association are the Camden and Hickory soils. The gently sloping and moderately sloping, well drained Camden soils are on stream terraces. The strongly sloping to steep, well drained Hickory soils are on side slopes in the uplands adjacent to the flood plains. The minor soils are not subject to flooding.

The major soils are used mainly for cultivated crops. Some areas are used as woodland or pasture. These soils are well suited to cultivated crops and pasture and are moderately suited or well suited to woodland. They are well suited to habitat for woodland wildlife. The seasonal high water table and flooding are management concerns. Flooded areas furnish temporary feeding and resting sites for migrating and resident waterfowl.

This association generally is unsuitable as a site for dwellings and septic tank absorption fields because of the flooding.

Broad Land Use Considerations

The soils in Effingham County vary widely in their suitability for major land uses. They are used mainly for cultivated crops, primarily corn, soybeans, and wheat. Other uses include hay, pasture, and woodland.

Corn, soybeans, and wheat are grown most extensively in associations 1 and 3. The soils in these associations are moderately suited or well suited to cultivated crops. The seasonal high water table is a problem on the major soils that are nearly level or are in low areas, such as Cisne, Holton, Hoyleton, and Newberry soils. Also, flooding causes crop damage during some years in areas of Holton and Wirt soils (fig. 4).

Most of the areas that are used for hay and pasture are in association 2. Alfalfa, orchardgrass, and bromegrass are common hay and pasture species. The less sloping major soils, such as Ava and Bluford soils, are well suited to hay and pasture. The erosion hazard and the seasonal high water table are management concerns. The steeper Hickory soils are limited by the slope and the hazard of water erosion.

Most of the woodland is in associations 2 and 3. The major soils, such as Ava, Hickory, Holton, and Wirt soils, are well suited to woodland. Bluford soils are only moderately suited because of wetness. Hickory soils are limited by the erosion hazard and the equipment limitation, both of which are the result of slope. Important upland trees in the county include white oak, red oak, black oak, hickory, and ash. Silver maple, eastern cottonwood, and American sycamore are abundant in the wooded areas of association 3.

Sites for dwellings and septic tank absorption fields are available in each of the associations. Associations 1 and 2 generally are poorly suited to these uses because of the seasonal high water table, the shrink-swell potential, and restricted permeability. Ava soils are only moderately suited to dwellings without basements because of the shrink-swell potential. The major soils in association 3 generally are unsuited to dwellings and septic tank absorption fields because of flooding.

The major soils in association 1 are moderately suited or well suited to habitat for openland wildlife. The ones in associations 2 and 3 are well suited to habitat for woodland wildlife. The Cisne and Newberry soils in association 1 have good potential for wetland wildlife habitat.

Figure 4.—Crop damage caused by flooding in an area of Holton soils.

The major soils in association 1 generally are poorly suited to recreational development because of the seasonal high water table. The ones in association 2 are moderately suited or well suited to most recreational uses. The slope of the Hickory soils in this association is a limitation. The major soils in association 3 are poorly suited to most recreational uses because of flooding.

Detailed Soil Map Units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and Management of the Soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Hickory silt loam, 10 to 15 percent slopes, eroded, is a phase of the Hickory series.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

Soil Descriptions

2—Cisne silt loam. This nearly level, poorly drained soil is on broad plains in the uplands. Individual areas are irregular in shape and range from 3 to 400 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 8 inches thick. The subsurface layer is light brownish gray, friable silt loam about 8 inches thick. The subsoil extends to a depth of more than 60 inches. It is mottled and firm. The upper part is grayish brown silty clay loam. The lower part is dark grayish brown clay loam. In some areas the surface layer is lighter in color. In other areas the subsoil has less clay. In some places the surface layer has more clay. In other places the subsoil contains free carbonates.

Included with this soil in mapping are small areas of the somewhat poorly drained Darmstadt and poorly drained Huey soils. These soils have a high content of sodium in the subsoil. They are in landscape positions similar to those of the Cisne soil. Also included are the somewhat poorly drained Hoyleton soils on ridges and knolls. Included soils make up 5 to 15 percent of the unit.

Water and air move through the Cisne soil at a very slow rate. Surface runoff is slow. The seasonal high water table is perched within a depth of 2 feet during the period February through June in most years. Available water capacity is high. The content of organic matter is moderately low. The surface layer is friable and can be easily tilled throughout a wide range in moisture content. The shrink-swell potential is high.

In most areas this soil is cultivated. It is moderately suited to cultivated crops. It is poorly suited to dwellings

and septic tank absorption fields.

Because a drainage system has been installed, this soil can be used for corn, soybeans, and small grain. The drainage system should be maintained, and in some areas additional drainage measures are needed. A combination of random subsurface drains and surface inlets can improve drainage. Soil blowing is a hazard. Leaving crop residue on the surface and establishing field windbreaks help to prevent excessive soil loss. Returning crop residue to the soil, adding other organic material, and keeping tillage to a minimum increase the rate of water infiltration and help to maintain good tilth. Tilling when the soil is too wet causes soil compaction and decreases the rate of water infiltration.

If this soil is used as a site for dwellings, the seasonal high water table and the high shrink-swell potential are limitations. Backfilling foundation trenches with sand and gravel and reinforcing footings and foundations help to prevent the structural damage caused by shrinking and swelling. Subsurface drains around the footings help to lower the water table. Also, constructing the floor of dwellings without basements at an elevation above the surrounding ground level, grading the site, and diverting surface water reduce the wetness.

The seasonal wetness and the very slow permeability are limitations on sites for septic tank absorption fields. Sewage lagoons function very well on this soil. A septic tank system that includes a sealed sand filter and a disinfection tank or an evapotranspiration bed also can function satisfactorily.

The land capability classification is IIIw.

3A—Hoyleton silt loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on broad ridges in the uplands. Individual areas are irregular in shape and range from 3 to 500 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 9 inches thick. The subsurface layer is dark brown, friable silt loam about 4 inches thick. The subsoil is about 39 inches thick. It is mottled. The upper part is dark yellowish brown and grayish brown, firm silty clay loam. The next part is dark brown and brown, firm silty clay loam. The lower part is dark brown, very firm loam. The underlying material to a depth of 60 inches or more is yellowish brown, mottled, very firm loam. In some areas, the surface soil is thicker and the lower part of the soil is darker. In other areas the subsoil has a higher proportion of gray colors.

Included with this soil in mapping are small areas of Cisne, Darmstadt, and Huey soils. The poorly drained Cisne and Huey soils are on flats below the Hoyleton soil. Darmstadt and Huey soils have a high content of sodium in the subsoil. Darmstadt soils are in landscape positions similar to those of the Hoyleton soil. Included soils make up 5 to 15 percent of the unit.

Water and air move through the Hoyleton soil at a slow rate. Surface runoff is slow. The seasonal high water table is at a depth of 1 to 3 feet from March through June in most years. Available water capacity is very high. The content of organic matter is moderately low. The surface layer is friable and can be easily tilled throughout a wide range in moisture content. The shrink-swell potential is high.

In most areas this soil is used for corn, soybeans, or small grain. It is well suited to cultivated crops. It is poorly suited to dwellings and septic tank absorption fields.

In areas used for corn, soybeans, or small grain, planting may be delayed in some years because of wetness. A combination of random subsurface drains and surface inlets improves drainage. Water erosion is a hazard in some areas unless the surface is protected. A system of conservation tillage that leaves crop residue on the surface after planting helps to prevent excessive soil loss. Returning crop residue to the soil and regularly adding other organic material increase the rate of water infiltration and improve tilth. Tilling when the soil is too wet causes soil compaction and reduces the rate of water infiltration.

If this soil is used as a site for dwellings, the seasonal high water table and the high shrink-swell potential are limitations. Backfilling foundation trenches with sand and gravel and reinforcing footings and foundations help to prevent the structural damage caused by shrinking and swelling. Subsurface drains around the footings help to lower the water table. Also, constructing the floor of dwellings without basements at an elevation above the surrounding ground level, grading the site, and diverting surface water reduce the wetness.

The seasonal wetness and the very slow permeability are limitations on sites for septic tank absorption fields. Sewage lagoons function very well on this soil. A septic tank system that includes a sealed sand filter and a disinfection tank or an evapotranspiration bed also can function satisfactorily.

The land capability classification is IIw.

3B—Hoyleton silt loam, 2 to 7 percent slopes. This gently sloping, somewhat poorly drained soil is on ridges, side slopes, and knolls in the uplands. Individual areas are irregular in shape and range from 5 to 320 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 9 inches thick. The subsurface layer is yellowish brown, friable silt loam about 6 inches thick. The subsoil to a depth of more than 60 inches is mottled, firm and very firm silty clay loam. The upper part is yellowish brown and brown. The next part is pale brown. The lower part is grayish brown. In some places the subsoil is not so gray. In other places the surface layer is lighter in color. In some eroded areas cultivation has mixed the surface layer with the upper part of the subsoil.

Included with this soil in mapping are small areas of the poorly drained Cisne and Huey soils on the lower flats. Also included are the somewhat poorly drained Darmstadt soils in landscape positions similar to those of the Hoyleton soil. Darmstadt and Huey soils have a high content of sodium in the subsoil. Included soils make up 5 to 15 percent of the unit.

Water and air move through the Hoyleton soil at a slow rate. Surface runoff is medium. The seasonal high water table is at a depth of 1 to 3 feet during the period March through June in most years. Available water capacity is very high. The content of organic matter is moderately low. The surface layer is friable and can be easily tilled throughout a wide range in moisture content. The shrink-swell potential is high.

In most areas this soil is cultivated. It is well suited to cultivated crops. It is poorly suited to dwellings and septic tank absorption fields.

In areas used for corn, soybeans, or small grain, water erosion is a hazard unless the surface is protected. A system of conservation tillage that leaves crop residue on the surface after planting, contour farming, and terraces help to prevent excessive soil loss. Planting may be delayed in some years by the seasonal high water table. A combination of random subsurface drains and surface inlets improves drainage. Returning crop residue to the soil and regularly adding other organic material increase the rate of water infiltration and improve tilth. Tilling when the soil is too wet causes soil compaction and reduces the rate of water infiltration.

The seasonal high water table and the high shrink-swell potential are severe limitations on sites for dwellings. Reinforcing footings and foundations helps to prevent the structural damage caused by shrinking and swelling. Subsurface drains around the footings help to lower the water table.

The seasonal high water table and the slow permeability are severe limitations on sites for septic tank absorption fields. A sewage lagoon can function satisfactorily if the site is leveled. A septic tank system that includes a sealed sand filter and a disinfection tank or an evapotranspiration bed also can function satisfactorily.

The land capability classification is IIe.

7C2—Atlas silt loam, 4 to 12 percent slopes, eroded. This moderately sloping, somewhat poorly drained soil is on side slopes in the uplands. Individual areas are irregular in shape and range from 3 to 110 acres in size.

Typically, the surface layer is brown, friable silt loam. Water erosion has reduced the thickness of the original surface soil to about 6 inches. The subsoil extends to a depth of more than 60 inches. The upper part is grayish brown, firm silty clay loam. The next part is grayish brown, mottled, very firm and firm clay loam. The lower part is light brownish gray, mottled, firm clay loam and loam. In some areas the subsoil contains less clay.

Included with this soil in mapping are small areas of the moderately well drained Tamalco soils. These soils have a high content of sodium. They are in landscape positions similar to those of the Atlas soil. Also included are the well drained Hickory soils on the lower parts of the slopes and the moderately well drained Ava soils on side slopes and ridges above the Atlas soil. Included soils make up 10 to 15 percent of the unit.

Water and air move through the Atlas soil at a very slow rate. Surface runoff is rapid. The seasonal high water table is perched within a depth of 2 feet from April through June in most years. Available water capacity is high. The content of organic matter is low. The surface layer is friable. The shrink-swell potential is high in the subsoil. Many areas have seepy spots. This soil dries more slowly in the spring than the surrounding soils and tends to be droughty late in the growing season.

In most areas this soil is used for cultivated crops, hay, or pasture. It is moderately suited to cultivated crops, pasture, and hay and is well suited to woodland. It is poorly suited to dwellings and septic tank absorption fields.

If this soil is used for corn, soybeans, or small grain, further water erosion is a hazard. A conservation tillage system that leaves crop residue on the surface after planting, contour farming, and a crop rotation that includes 1 or more years of forage crops help to prevent excessive soil loss. Returning crop residue to the soil and regularly adding organic material increase the rate of water infiltration and improve tilth. Tilling when the soil is too wet causes soil compaction, decreases the rate of water infiltration, and causes excessive runoff and erosion.

Growing grasses and legumes for pasture or hay

improves tilth and helps to control water erosion. This soil is suitable for a mixture of alfalfa and either orchardgrass or tall fescue. Proper stocking rates, rotation grazing, deferred grazing, and applications of fertilizer help to keep the pasture in good condition.

If this soil is used as woodland, seedling mortality and windthrow are management concerns. They are caused by the high content of clay in the soil. Selecting mature planting stock reduces the seedling mortality rate. Applying harvest methods that do not isolate the remaining trees or leave them widely spaced and removing only high-value trees from a strip 50 feet wide along the west and south edges of the woodland reduce the hazard of windthrow. Controlling grazing by livestock helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire help to prevent tree damage and maintain the leaf mulch.

If this soil is used as a site for dwellings, the seasonal high water table and the shrink-swell potential are limitations. Installing either tile drains near the foundations or interceptor drains higher on the side slopes than the building helps to lower the water table. Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

The seasonal high water table and the very slow permeability are limitations if this soil is used as a site for septic tank absorption fields. The septic tank system can function satisfactorily if a sealed sand filter and a disinfection tank or an evapotranspiration bed are installed. Sewage lagoons function satisfactorily if the site is leveled.

The land capability classification is IIIe.

7C3—Atlas silty clay loam, 4 to 12 percent slopes, severely eroded. This moderately sloping, somewhat poorly drained soil is on side slopes in the uplands. In most areas, nearly all of the original surface soil has been removed by water erosion and tillage has mixed the rest with the upper part of the subsoil. Individual areas are irregular in shape and range from 3 to 25 acres in size.

Typically, the surface layer is dark yellowish brown, firm silty clay loam about 7 inches thick. It is mostly subsoil material. The subsoil extends to a depth of more than 60 inches. It is firm and brittle. The upper part is gray and grayish brown silty clay loam and clay loam. The next part is grayish brown loam and clay loam. The lower part is gray and dark grayish brown clay loam. In some areas the subsoil contains less clay.

Included with this soil in mapping are small areas of Ava and Hickory soils. The moderately well drained Ava soils are on ridges above the Atlas soil. The well drained Hickory soils are on side slopes below the Atlas soil. Also included are small seepy areas, generally on the upper part of the side slopes, and small areas of soils that have a high content of sodium in the subsoil. Included areas make up 10 to 15 percent of the unit.

Water and air move through the Atlas soil at a very slow rate. Surface runoff is rapid. The seasonal high water table is perched within a depth of 2 feet during the period April through June in most years. Available water capacity is moderate. The content of organic matter is low. The surface layer is firm and sticky when wet and hard and cloddy when dry. This soil is more difficult to till than the adjacent soils that are less eroded. It dries more slowly in the spring than the surrounding soils and tends to be droughty late in the growing season. The shrink-swell potential is high.

In most areas this soil is used for cultivated crops, hay, or pasture. It is poorly suited to cultivated crops, pasture, and hay because it is highly susceptible to erosion. The predicted yield levels are low. The soil is moderately suited to woodland and poorly suited to dwellings and septic tank absorption fields.

Water erosion is a hazard in areas used for corn, soybeans, or small grain. Terraces, conservation tillage systems that leave crop residue on the surface after planting, contour farming, and a crop rotation that includes several years of forage crops can help to prevent excessive soil loss. Adding organic material to the soil improves tilth and minimizes crusting.

Establishing pasture and hay crops helps to keep soil loss within tolerable limits. This soil is suited to alfalfa, orchardgrass, and tall fescue. Seedbed preparation is difficult on side slopes where the subsoil is exposed. A no-till method of seeding or pasture renovation helps in establishing forage species and in controlling water erosion. The plants should not be grazed or clipped until they are sufficiently established. Proper stocking rates, rotation grazing, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition and prevent surface compaction and excessive runoff.

If this soil is used as woodland, seedling mortality and windthrow are management concerns. They are caused by the high content of clay in the soil. Selecting mature planting stock reduces the seedling mortality rate. Applying harvest methods that do not isolate the remaining trees or leave them widely spaced and removing only high-value trees from a strip 50 feet wide along the west and south edges of the woodland reduce

the hazard of windthrow. Controlling grazing by livestock helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire help to prevent tree damage and maintain the leaf mulch.

If this soil is used as a site for dwellings, the seasonal high water table and the shrink-swell potential are limitations. Installing either tile drains near the foundations or interceptor drains higher on the side slopes than the building helps to lower the water table. Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

The seasonal high water table and the very slow permeability are limitations if this soil is used as a site for septic tank absorption fields. The septic tank system can function satisfactorily if a sealed sand filter and a disinfection tank or an evapotranspiration bed are installed. Sewage lagoons function satisfactorily if the site is leveled.

The land capability classification is IVe.

8D2—Hickory silt loam, 10 to 15 percent slopes, eroded. This strongly sloping, well drained soil is on side slopes along drainageways in the uplands. Individual areas are long and narrow or irregularly shaped and range from 5 to 130 acres in size.

Typically, the surface soil is dark brown, friable silt loam. Water erosion has reduced the thickness of the original surface soil to about 8 inches. The subsoil is mottled, firm clay loam about 44 inches thick. The upper part is yellowish brown. The lower part is light brownish gray. The underlying material to a depth of 60 inches or more is yellowish brown loam. In some areas the soil is severely eroded and has a surface layer of clay loam. In places the slope is less than 10 percent.

Included with this soil in mapping are small areas of the well drained Wirt and somewhat poorly drained Holton soils. These soils are on the bottom land below the Hickory soil. Also included are small areas of soils that have a high content of exchangeable sodium in the subsoil. Included soils make up less than 10 percent of the unit.

Water and air move through the Hickory soil at a moderate rate. Surface runoff is rapid. Available water capacity is high. The content of organic matter is low. The shrink-swell potential is moderate.

In most areas this soil is used as pasture or woodland. In some areas it is used as cropland. It is well suited to woodland. It is moderately suited to pasture and cultivated crops and to dwellings and septic tank absorption fields.

Further water erosion is a hazard if this soil is used for corn, soybeans, or small grain. Also, poor tilth is a limitation. Soil loss can be kept within tolerable limits by a crop rotation dominated by forage crops and by a combination of contour farming and a conservation tillage system that leaves crop residue on the surface after planting. Stripcropping also helps to prevent excessive soil loss. Returning crop residue to the soil and regularly adding other organic material help to maintain productivity, prevent crusting, and improve tilth.

Growing grasses and legumes for pasture or hay improves tilth and helps to control erosion. This soil is suitable for a mixture of alfalfa and either orchardgrass or tall fescue. Proper stocking rates, rotation grazing, deferred grazing, and applications of fertilizer help to keep the pasture in good condition.

The main management concern in the areas used as woodland is plant competition, which affects desirable seedlings. The competition from undesirable plants in openings created by timber harvesting can be controlled by chemical or mechanical means. Controlling grazing by livestock helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire help to prevent tree damage and maintain the leaf mulch.

If this soil is used as a site for dwellings, the slope and the shrink-swell potential are limitations. Cutting, filling, and land shaping help to overcome the slope. Extending foundation footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

The moderate permeability and the slope are limitations if this soil is used as a site for septic tank absorption fields. Increasing the size of the absorption field or replacing the soil with more permeable material helps to overcome the moderate permeability. Installing the filter lines on the contour or cutting and land shaping help to overcome the slope.

The land capability classification is IIIe.

8E—Hickory loam, 15 to 20 percent slopes. This moderately steep, well drained soil is on side slopes along drainageways in the uplands. Individual areas are long and narrow and range from 5 to 50 acres in size.

Typically, the surface layer is dark brown, friable loam about 6 inches thick. The subsurface layer is dark yellowish brown, friable loam about 3 inches thick. The

subsoil extends to a depth of more than 60 inches. The upper part is dark yellowish brown and yellowish brown, friable silt loam and firm silty clay loam. The next part is yellowish brown and light yellowish brown, mottled, firm silty clay loam. The lower part is light yellowish brown, mottled, firm loam. In some areas the surface layer contains more clay. In other areas the slope is more than 20 percent. In places the lower part of the subsoil formed in material weathered from sandstone or shale.

Included with this soil in mapping are small areas of the somewhat poorly drained Holton soils. These soils are on the bottom land below the Hickory soil. They make up less than 10 percent of the unit.

Water and air move through the Hickory soil at a moderate rate. Surface runoff is rapid. Available water capacity is high. The content of organic matter is low. The shrink-swell potential is moderate.

In most areas this soil is used as woodland. In some areas it is used as pasture. It is poorly suited to cultivated crops and to hay. It is well suited to woodland and moderately suited to pasture. It is poorly suited to dwellings and septic tank absorption fields.

Unless the surface is protected, water erosion is a severe hazard if areas of this soil are used for corn, soybeans, or small grain. It can be controlled by a system of conservation tillage that leaves crop residue on the surface after planting, by contour farming, and by a cropping sequence that is dominated by forage crops. Tilling when the soil is wet causes surface cloddiness and compaction and excessive runoff and erosion. Returning crop residue to the soil and regularly adding other organic material increase the rate of water infiltration and improve tilth.

Establishing pasture and hay crops helps to control water erosion. This soil is suitable for a mixture of alfalfa and either orchardgrass or tall fescue. Overgrazing causes surface compaction, excessive runoff, and a greater susceptibility to erosion. Proper stocking rates and timely deferment of grazing help to prevent overgrazing. Applications of fertilizer are needed. The plants should not be grazed or clipped until they are sufficiently established. Tilling on the contour when a seedbed is prepared or the pasture is renovated helps to keep the pasture in good condition and helps to prevent excessive soil loss.

In areas of this soil used as woodland, the slope results in an erosion hazard and limits the use of equipment. Also, plant competition affects desirable seedlings. Erosion can be controlled by building logging roads and skid trails on or nearly on the contour, by skidding logs or trees uphill with a cable and winch on the steeper slopes, by establishing grass firebreaks, and by seeding bare areas to grass or to a grass-legume mixture after logging activities have been completed. The use of machinery is limited to periods when the soil is firm. The competition from undesirable plants in openings created by timber harvesting can be controlled by chemical or mechanical means. Controlling grazing by livestock helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire help to prevent tree damage and maintain the leaf mulch.

If this soil is used as a site for dwellings, the slope and the shrink-swell potential are limitations. Cutting, filling, and land shaping help to overcome the slope. Extending foundation footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

The moderate permeability and the slope are limitations if this soil is used as a site for septic tank absorption fields. Increasing the size of the absorption field or replacing the soil with more permeable material helps to overcome the moderate permeability. Installing the filter lines on the contour or cutting and land shaping help to overcome the slope.

The land capability classification is IVe.

8F—Hickory loam, 20 to 50 percent slopes. This steep, well drained soil is on side slopes along drainageways in the uplands. Individual areas are long and narrow and range from 5 to 130 acres in size.

Typically, the surface layer is dark grayish brown, friable loam about 2 inches thick. The subsurface layer is brown, friable loam about 7 inches thick. The subsoil is about 43 inches thick. The upper part is yellowish brown, firm clay loam. The lower part is yellowish brown and brown, firm gravelly clay loam. The underlying material to a depth of 60 inches or more is brown, firm gravelly clay loam. In some areas it is sandy. In other areas the slope is less than 20 percent. In some places the subsoil contains free carbonates. In other places the lower part of the subsoil formed in material weathered from shale. In a few areas the soil is severely eroded and has a surface layer of clay loam or silty clay loam.

Included with this soil in mapping are small areas of the somewhat poorly drained Holton soils on the adjacent bottom land. Also included are areas where sandstone is exposed near the base of the side slopes and areas of soils that are moderately deep or shallow to sandstone. Included areas make up less than 10 percent of the unit.

Water and air move through the Hickory soil at a moderate rate. Surface runoff is rapid. Available water

capacity is high. The content of organic matter is low. The shrink-swell potential is moderate.

In most areas this soil is wooded. It is well suited to woodland. It generally is unsuited to cultivated crops and pasture and to dwellings and septic tank absorption fields because of the slope.

In areas of this soil used as woodland, the slope results in an erosion hazard and limits the use of equipment. Also, plant competition affects desirable seedlings. Erosion can be controlled by building logging roads and skid trails on or nearly on the contour, by skidding logs or trees uphill with a cable and winch on the steeper slopes, by establishing grass firebreaks, and by seeding bare areas to grass or to a grass-legume mixture after logging activities have been completed. The use of machinery is limited to periods when the soil is firm. The competition from undesirable plants in openings created by timber harvesting can be controlled by chemical or mechanical means. Controlling grazing by livestock helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire help to prevent tree damage and maintain the leaf mulch.

The land capability classification is VIIe.

12—Wynoose silt loam. This level, poorly drained soil is on broad flats in the uplands. Individual areas are irregular in shape and range from 5 to 120 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsurface layer is grayish brown, mottled, friable silt loam about 12 inches thick. The subsoil is about 37 inches thick. It is firm and mottled. The upper part is grayish brown silty clay. The next part is light brownish gray silty clay loam. The lower part is grayish brown and gray silt loam. Below this to a depth of more than 64 inches is a buried layer of dark gray, mottled, friable loam. In some areas the surface layer is darker. In other areas the lower part of the subsoil and the underlying material contain less sand.

Included with this soil in mapping are small areas of the somewhat poorly drained Bluford soils on broad ridges and knolls and the moderately well drained Ava soils on convex ridgetops. Included soils make up less than 15 percent of the unit.

Water and air move through the Wynoose soil at a very slow rate. Surface runoff is slow. The seasonal high water table is perched within a depth of 2 feet during the period March through June in most years. Available water capacity is high. The content of organic matter is low. The surface layer is friable and can be easily tilled when moist. It tends to crust or puddle after hard rains. The shrink-swell potential is high in the subsoil.

In most areas this soil is cultivated. In some small areas it is used as woodland. It is moderately suited to cultivated crops and poorly suited to woodland. It is poorly suited to dwellings and septic tank absorption fields.

In areas used for corn, soybeans, or small grain, planting may be delayed in some years because of wetness. A combination of random subsurface drains and surface inlets improves drainage. Applying a system of conservation tillage that leaves crop residue on the surface after planting, returning crop residue to the soil, and regularly adding other organic material increase the rate of water infiltration and improve tilth. Tilling when the soil is too wet causes soil compaction and reduces the rate of water infiltration.

In areas of this soil used as woodland, the seasonal high water table limits the use of equipment and causes seedling mortality and a windthrow hazard. Also, plant competition is a management concern. The use of equipment is limited to periods when the soil is firm. Selecting mature planting stock and planting on ridges reduce the seedling mortality rate. Applying harvest methods that do not isolate the remaining trees or leave them widely spaced and removing only high-value trees from a strip 50 feet wide along the west and south edges of the woodland reduce the hazard of windthrow. The competition from undesirable plants in openings created by timber harvesting can be controlled by chemical or mechanical means. Controlling grazing by livestock helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire help to prevent tree damage and maintain the leaf mulch.

If this soil is used as a site for dwellings, the seasonal high water table and the high shrink-swell potential are limitations. Backfilling foundation trenches with sand and gravel and reinforcing footings and foundations help to prevent the structural damage caused by shrinking and swelling. Subsurface drains around the footings help to lower the water table. Also, constructing the floor of dwellings without basements at an elevation above the surrounding ground level, grading the site, and diverting surface water reduce the wetness.

The seasonal high water table and the very slow permeability are limitations on sites for septic tank absorption fields. Sewage lagoons function very well on

this soil. A septic tank system that includes a sealed sand filter and a disinfection tank or an evapotranspiration bed also can function satisfactorily.

The land capability classification is IIIw.

13A—Bluford silt loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on broad flats and ridges in the uplands. Individual areas are irregular in shape and range from 5 to 400 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 9 inches thick. The subsurface layer is pale brown, friable silt loam about 3 inches thick. The upper part of the subsoil is brown, mottled, firm silty clay loam about 31 inches thick. The lower part to a depth of more than 60 inches is firm, mottled, light brownish gray silty clay loam and loam. In some areas the lower part of the subsoil contains less sand. In other areas the subsurface layer is considerably thicker and the subsoil has a lower content of clay.

Included with this soil in mapping are small areas of the moderately well drained Ava and poorly drained Wynoose soils. Ava soils have less clay in the subsoil and are on ridges and knolls above the Bluford soil. Wynoose soils are on flats and depressions below the Bluford soil. Included soils make up 10 to 15 percent of the unit.

Water and air move through the Bluford soil at a slow rate. Surface runoff is slow. The seasonal high water table is at a depth of 1 to 3 feet during the period March through June in most years. Available water capacity is high. The content of organic matter is moderately low. The surface layer is friable and can be easily tilled when moist. It tends to crust and puddle after hard rains. The shrink-swell potential is moderate.

In most areas this soil is cultivated. In some areas it is used as woodland. It is well suited to cultivated crops and moderately suited to woodland. It is poorly suited to dwellings and septic tank absorption fields.

In areas used for corn, soybeans, or small grain, planting may be delayed in some years because of wetness. A combination of random subsurface drains and surface inlets improves drainage. Returning crop residue to the soil and regularly adding other organic material increase the rate of water infiltration and improve tilth. Tilling when the soil is too wet causes soil compaction and reduces the rate of water infiltration.

The main management concern in the areas used as woodland is plant competition, which affects desirable seedlings. The competition from undesirable plants in openings created by timber harvesting can be controlled by chemical or mechanical means. Controlling grazing by livestock helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire help to prevent tree damage and maintain the leaf mulch.

The seasonal high water table and the slow permeability are severe limitations on sites for septic tank absorption fields. A sewage lagoon can function satisfactorily if the site is leveled. A septic tank system that includes a sealed sand filter and a disinfection tank or an evapotranspiration bed also can function satisfactorily.

The land capability classification is IIw.

13B—Bluford silt loam, 2 to 5 percent slopes. This gently sloping, somewhat poorly drained soil is on broad ridges in the uplands. Individual areas are long and narrow or irregularly shaped and range from 5 to 110 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsurface layer is pale brown, friable silt loam about 4 inches thick. The subsoil extends to a depth of more than 60 inches. It is firm and mottled. The upper part is brown silty clay loam. The next part is brown silty clay and silty clay loam. The lower part is grayish brown silt loam and loam. In some areas the lower part of the subsoil contains less sand. In some eroded areas the surface layer contains subsoil material and is firm silty clay loam.

Included with this soil in mapping are small areas of the moderately well drained Ava and poorly drained Wynoose soils. Ava soils have less clay in the subsoil. They are on ridges and knolls above the Bluford soil. Wynoose soils are in depressions below the Bluford soil. Included soils make up 5 to 15 percent of the unit.

Water and air move through the Bluford soil at a slow rate. Surface runoff is medium. The seasonal high water table is perched at a depth of 1 to 3 feet during the period March through June in most years. Available water capacity is high. The content of organic matter is moderately low. The surface layer is friable and can be easily tilled when moist. It tends to crust and puddle after hard rains, especially in areas where the plow layer contains subsoil material. The shrink-swell potential is moderate.

In most areas this soil is cultivated. In some areas it is used as woodland. It is well suited to cultivated crops and moderately suited to woodland. It is poorly suited to dwellings and septic tank absorption fields.

Because a drainage system has been installed, this soil can be used for corn, soybeans, and small grain.

Water erosion is a hazard. It can be controlled, however, by a system of conservation tillage that leaves crop residue on the surface after planting and by contour farming or terraces. Also, wetness delays planting in some years. Tilling when the soil is wet causes surface cloddiness and compaction and excessive runoff and erosion. Returning crop residue to the soil and regularly adding other organic material increase the rate of water infiltration and improve tilth.

The main management concern in the areas used as woodland is plant competition, which affects desirable seedlings. The competition from undesirable plants in openings created by timber harvesting can be controlled by chemical or mechanical means. Controlling grazing by livestock helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire help to prevent tree damage and maintain the leaf mulch.

The seasonal high water table and the moderate shrink-swell potential are moderate limitations on sites for dwellings without basements. The seasonal high water table is a severe limitation on sites for dwellings with basements. Reinforcing footings and foundations helps to prevent the structural damage caused by shrinking and swelling. Subsurface drains around the footings help to lower the water table.

The land capability classification is IIe.

14B—Ava silt loam, 1 to 5 percent slopes. This gently sloping, moderately well drained soil is on crests of narrow ridgetops in the uplands. Individual areas are irregular in shape and range from 5 to 60 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 9 inches thick. The subsurface layer is dark yellowish brown, mottled, friable silt loam about 6 inches thick. The subsoil extends to a depth of more than 60 inches. It is mottled. The upper part is yellowish brown, friable silty clay loam. The next part is pale brown and brown, firm silty clay loam. The lower part is grayish brown, very firm silty clay loam and silt loam. In some areas the subsoil contains more sand and gravel. In other areas the slope is more than 5 percent. In places the lower part of the subsoil contains less sand.

Included with this soil in mapping are small areas of the somewhat poorly drained Bluford soils. These soils are on the lower, broader ridges and on side slopes below the Ava soil. They make up less than 10 percent of the unit.

Water and air move through the upper part of the Ava soil at a moderate rate, through the middle part at a moderately slow rate, and through the lower part at a very slow rate. Surface runoff is medium. The seasonal high water table is at a depth of 1.5 to 3.5 feet during the period March through June in most years. Available water capacity is high. The content of organic matter is moderately low. The surface layer is friable and can be easily tilled when moist. The shrink-swell potential is moderate.

In most areas this soil is used for cultivated crops or as woodland (fig. 5). It is well suited to cultivated crops and woodland. It is moderately suited to dwellings without basements and poorly suited to dwellings with basements and to septic tank absorption fields.

Measures that control water erosion are needed in the areas used for soybeans, corn, or small grain. Examples are a system of conservation tillage that leaves crop residue on the surface after planting, contour farming, and terraces. Tilling when the soil is wet causes surface cloddiness and compaction and excessive runoff and erosion. Returning crop residue to the soil and regularly adding other organic material help to maintain tilth and fertility.

The main management concern in the areas used as woodland is plant competition, which affects desirable seedlings. The competition from undesirable plants in openings created by timber harvesting can be controlled by chemical or mechanical means. Controlling grazing by livestock helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire help to prevent tree damage and maintain the leaf mulch.

The seasonal high water table and the shrink-swell potential are limitations if this soil is used as a site for dwellings. The wetness is a more severe limitation on sites for dwellings with basements than on sites for dwellings without basements. Reinforcing footings and foundations helps to prevent the structural damage caused by shrinking and swelling. Installing subsurface drains around the foundations lowers the water table.

The seasonal wetness and the very slow permeability are limitations on sites for septic tank absorption fields. Sewage lagoons function very well on this soil. A septic tank system that includes a sealed sand filter and a disinfection tank or an evapotranspiration bed also can function satisfactorily.

The land capability classification is IIe.

14C2—Ava silt loam, 5 to 12 percent slopes, eroded. This moderately sloping, moderately well drained soil is along drainageways and on side slopes in the uplands. Individual areas are irregular in shape

Figure 5.—Yellow poplar in an area of Ava silt loam, 1 to 5 percent slopes.

and range from 5 to 30 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam. Erosion has reduced the thickness of the original surface layer to about 6 inches. The subsurface layer is yellowish brown, friable silt loam about 4 inches thick. The subsoil is about 46 inches thick. The upper part is yellowish brown and brown, firm silty clay loam. The next part is brown, mottled, firm silty clay loam. The lower part is brown, mottled, friable loam and silt loam. The underlying material to a depth of 60 inches or more is light brownish gray, mottled, firm loam. In some areas, cultivation has mixed the plow layer with the subsoil and the surface layer is silty clay loam. In other areas the slope is more than 12 percent. In places the subsoil contains more sand and gravel.

Included with this soil in mapping are small areas of the somewhat poorly drained Bluford and well drained

Parke soils. Parke soils are moderately permeable throughout. They are on ridges above the Ava soil. Bluford soils are on gently sloping ridges below the Ava soil. Included soils make up less than 10 percent of the unit.

Water and air move through the upper part of the Ava soil at a moderate rate, through the middle part at a moderately slow rate, and through the lower part at a very slow rate. Surface runoff is medium. The seasonal high water table is at a depth of 1.5 to 3.5 feet during the period March through June in most years. Available water capacity is high. The content of organic matter is low. The surface layer is friable. It tends to crust or puddle after hard rains, especially in areas where the plow layer contains subsoil material. The shrink-swell potential is moderate.

In most areas this soil is cultivated. In some areas it is used as woodland or pasture. It is well suited to woodland. It is moderately suited to cultivated crops, to pasture and hay, and to dwellings. It is poorly suited to septic tank absorption fields.

Measures that control water erosion are needed in the areas used for soybeans, corn, or small grain. Examples are a system of conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, and a crop rotation that includes 1 or more years of forage crops. Tilling when the soil is wet causes surface cloddiness and compaction and excessive runoff and erosion. Returning crop residue to the soil and regularly adding other organic material increase the rate of water infiltration and help to maintain tilth.

Growing grasses and legumes for pasture or hay improves tilth and helps to control erosion. This soil is suitable for a mixture of alfalfa and either orchardgrass or tall fescue. Proper stocking rates, rotation grazing, deferred grazing, and applications of fertilizer help to keep the pasture in good condition.

The main management concern in the areas used as woodland is plant competition, which affects desirable seedlings. The competition from undesirable plants in openings created by timber harvesting can be controlled by chemical or mechanical means. Controlling grazing by livestock helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire help to prevent tree damage and maintain the leaf mulch.

The seasonal high water table and the shrink-swell potential are limitations if this soil is used as a site for dwellings. The wetness is a more severe limitation on sites for dwellings with basements than on sites for dwellings without basements. Reinforcing footings and foundations helps to prevent the structural damage caused by shrinking and swelling. Installing subsurface drains around the foundations lowers the water table.

The seasonal high water table and the very slow permeability are limitations if this soil is used as a site for septic tank absorption fields. The septic tank system can function satisfactorily if a sealed sand filter and a disinfection tank or an evapotranspiration bed are installed. Sewage lagoons function satisfactorily if the site is leveled.

The land capability classification is IIIe.

15B—Parke silt loam, 1 to 5 percent slopes. This gently sloping, well drained soil is on ridges and side slopes in the uplands. Individual areas are irregular in shape and range from 5 to 30 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 6 inches thick. The subsurface layer is dark yellowish brown, friable silt loam about 3 inches thick. The subsoil extends to a depth of more than 60 inches. The upper part is dark yellowish brown, firm silty clay loam. The next part is dark brown, firm silt loam. The lower part is dark brown and strong brown, mottled, firm loam. In some areas the subsoil has more sand. In other areas the subsoil has less sand. In places the lower part of the subsoil is mottled.

Included with this soil in mapping are small areas of the somewhat poorly drained, slowly permeable Bluford soils. These soils are on low ridges below the Parke soil. They make up 5 to 10 percent of the unit.

Water and air move through the Parke soil at a moderate rate. Surface runoff is medium. Available water capacity is high. The content of organic matter is moderately low. The surface layer tends to crust and puddle after hard rains. The shrink-swell potential is moderate.

In most areas this soil is cultivated. In some areas it is used as pasture, hayland, or woodland. It is well suited to cultivated crops, pasture, hay, and woodland. It is also well suited to dwellings with basements and to septic tank absorption fields. It is moderately suited to dwellings without basements.

Measures that control water erosion are needed in the areas used for corn, soybeans, or small grain. Examples are a system of conservation tillage that leaves crop residue on the surface after planting, contour farming, and terraces. Tilling when the soil is wet causes surface cloddiness and compaction and excessive runoff and water erosion. Returning crop residue to the soil and regularly adding other organic material help to maintain tilth and fertility.

Growing grasses and legumes for pasture or hay improves tilth and helps to control erosion. This soil is suitable for a mixture of alfalfa and either orchardgrass or tall fescue. Proper stocking rates, rotation grazing, deferred grazing, and applications of fertilizer help to keep the pasture in good condition.

The main management concern in the areas used as woodland is plant competition, which affects desirable seedlings. The competition from undesirable plants in openings created by timber harvesting can be controlled by chemical or mechanical means. Controlling grazing by livestock helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire help to prevent tree damage and maintain the leaf mulch.

The shrink-swell potential is a limitation if this soil is used as a site for dwellings without basements. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling.

The land capability classification is IIe.

15C2—Parke silt loam, 5 to 10 percent slopes, eroded. This moderately sloping, well drained soil is on ridges and side slopes in the uplands. Individual areas are irregular in shape and range from 5 to 50 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam. Erosion has reduced the thickness of the original surface layer to about 5 inches. The subsurface layer is dark yellowish brown, friable silty clay loam about 6 inches thick. The subsoil extends to a depth of more than 60 inches. It is mottled. The upper part is strong brown, firm silty clay loam. The next part is yellowish red, firm silt loam. The lower part is reddish brown and red, friable loam. In severely eroded areas the surface layer is silty clay loam. In some areas there is more sand in the upper part of the subsoil. In other areas the subsoil has less sand. In places the reddish colors are below a depth of 40 inches.

Water and air move through this soil at a moderate rate. Surface runoff is medium. Available water capacity is high. The content of organic matter is low. The surface layer tends to crust and puddle after hard rains, especially in areas where the subsoil is mixed into the plow layer. The shrink-swell potential is moderate.

In most areas this soil is cultivated. In some areas it is used as pasture, hayland, or woodland. It is moderately suited to cultivated crops. It is well suited to pasture and hay, to woodland, and to septic tank absorption fields. It is moderately suited to dwellings.

Measures that control water erosion are needed in the areas used for soybeans, corn, or small grain. Examples are a system of conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, and a crop rotation that includes 1 or more years of forage crops. Tilling when the soil is wet causes surface cloddiness and compaction and excessive runoff and water erosion. Returning crop residue to the soil and regularly adding other organic material increase the rate of water infiltration and help to maintain tilth.

The main management concern in the areas used as woodland is plant competition, which affects desirable seedlings. The competition from undesirable plants in openings created by timber harvesting can be controlled by chemical or mechanical means. Controlling grazing by livestock helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire help to prevent tree damage and maintain the leaf mulch.

The shrink-swell potential is a limitation if this soil is used as a site for dwellings without basements. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling.

The land capability classification is IIIe.

48—Ebbert silt loam. This nearly level, poorly drained and very poorly drained soil is in depressions on till plains. It is subject to ponding for brief periods from April through June. Individual areas are oval or irregularly shaped and range from 3 to 100 acres in size.

Typically, the surface layer is very dark gray, friable silt loam about 7 inches thick. The subsurface layer is very dark gray and dark gray, friable silt loam about 15 inches thick. The subsoil is dark gray and grayish brown, mottled silty clay loam about 26 inches thick. The upper part is firm, and the lower part is friable. The underlying material to a depth of 60 inches or more is gray, mottled, very firm silty clay loam. In some areas the surface layer contains more clay. In other areas the subsoil contains less clay. In places the dark colors extend to a depth of more than 24 inches.

Water and air move through this soil at a slow rate. Surface runoff is slow to ponded. The seasonal high water table is 0.5 foot above to 2.0 feet below the surface during the period April through July in most years. Available water capacity is very high. The content of organic matter is moderate. The surface layer is friable and can be easily tilled when moist. The shrink-swell potential is moderate.

In most areas this soil is cultivated. It is well suited to

cultivated crops. It generally is unsuited to dwellings and septic tank absorption fields because of the ponding.

Because a drainage system has been installed, this soil can be used for soybeans, corn, and small grain. The drainage system should be maintained, and in some areas additional drainage measures are needed. A combination of random subsurface drains and surface inlets can improve drainage. Soil blowing is a hazard. Leaving crop residue on the surface and establishing field windbreaks help to prevent excessive soil loss. Returning crop residue to the soil, adding other organic material, and keeping tillage to a minimum increase the rate of water infiltration and help to maintain good tilth. Tilling when the soil is too wet causes soil compaction and decreases the rate of water infiltration.

The land capability classification is IIw.

120—Huey silt loam. This nearly level, poorly drained soil is on broad plains in the uplands. Individual areas are irregular in shape and range from 4 to 65 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsurface layer is grayish brown, friable silt loam about 2 inches thick. The subsoil is about 47 inches thick. It is mottled. The upper part is dark grayish brown, firm silty clay loam and silty clay. The next part has a high content of sodium and is grayish brown, firm silty clay loam and silty clay. The lower part has a high content of sodium and is light brownish gray, firm silt loam. The underlying material to a depth of 65 inches or more is light brownish gray, friable loam. In some areas the surface layer is darker. In other areas the subsoil has more clay. In places the depth to the high concentration of sodium is greater.

Included with this soil in mapping are small areas of the poorly drained Cisne soils. These soils do not have a concentration of sodium in the subsoil. They are in landscape positions similar to those of the Huey soil. They make up 5 to 10 percent of the unit.

Water and air move through the Huey soil at a very slow rate. Surface runoff is slow. The seasonal high water table is perched within a depth of 2 feet from March through June in most years. The subsoil has a high content of sodium. Available water capacity is moderate. The content of organic matter is moderately low. The surface layer is friable but tends to crust and puddle after hard rains. The shrink-swell potential is moderate.

In most areas this soil is cultivated. It is poorly suited to cultivated crops, to hay and pasture, and to dwellings and septic tank absorption fields.

If this soil is used for corn, soybeans, or small grain, the seasonal high water table and the high content of sodium are limitations. Also, soil blowing is a hazard. A combination of random subsurface drains and surface inlets or of shallow ditches and outlets can improve drainage. The high amount of sodium in this soil reduces the availability and uptake of some plant nutrients and results in plant stress during dry periods in most years. Keeping tillage to a minimum, returning crop residue to the soil, and regularly adding other organic material increase water infiltration, improve tilth, and increase yields. Also, leaving crop residue on the surface helps to conserve soil moisture and to control soil blowing. Tilling when the soil is wet causes surface cloddiness and compaction and decreases the rate of water infiltration.

Establishing pasture and hay crops helps to maintain or improve tilth and to control soil blowing. Pasture and hay management can improve the quality and quantity of the forage and keep the soil in good condition. Management considerations include applications of fertilizer, weed control, rotation grazing, proper stocking rates, timely harvesting, and deferment of grazing.

If this soil is used as a site for dwellings, the seasonal high water table and the high shrink-swell potential are limitations. Backfilling foundation trenches with sand and gravel and reinforcing footings and foundations help to prevent the structural damage caused by shrinking and swelling. Subsurface drains around the footings help to lower the water table. Also, constructing the floor of dwellings without basements at an elevation above the surrounding ground level, grading the site, and diverting surface water reduce the wetness. The high content of sodium in the soil will cause difficulty in establishing and maintaining lawns. Selecting salt-tolerant grasses and watering frequently during dry periods can improve the quality of the lawn.

The seasonal wetness and the very slow permeability are limitations on sites for septic tank absorption fields. Sewage lagoons function very well on this soil. A septic tank system that includes a sealed sand filter and a disinfection tank or an evapotranspiration bed also can function satisfactorily.

The land capability classification is IVw.

134B—Camden silt loam, 1 to 5 percent slopes. This gently sloping, well drained soil is in convex areas on stream terraces. Individual areas are irregular in shape and range from 5 to 40 acres in size.

Typically, the surface layer is brown, friable silt loam about 8 inches thick. The subsurface layer is yellowish

brown, friable silt loam about 3 inches thick. The subsoil extends to a depth of more than 60 inches. It is firm. The upper part is yellowish brown silty clay loam and clay loam. The lower part is light yellowish brown fine sandy loam, silt loam, loam, and sandy loam. In some areas the seasonal high water table is within a depth of 60 inches. In other areas sandstone bedrock is within a depth of 60 inches. In some places the upper part of the subsoil contains less silt and more sand. In a few places the slope is more than 5 percent.

Water and air move through the upper part of this soil at a moderate rate and through the lower part at a moderate or moderately rapid rate. Surface runoff is medium. Available water capacity is high. The content of organic matter is moderately low. The shrink-swell potential is moderate.

In most areas this soil is cultivated. It is well suited to cultivated crops, pasture, hay, woodland, and septic tank absorption fields. It is moderately suited to dwellings.

Measures that control water erosion are needed in the areas used for corn, soybeans, or small grain. Examples are a system of conservation tillage that leaves crop residue on the surface after planting, contour farming, and terraces. Tilling when the soil is wet causes surface cloddiness and compaction and excessive runoff and water erosion. Returning crop residue to the soil and regularly adding other organic material help to maintain tilth and fertility.

Establishing pasture plants or hay on this soil helps to control erosion. The soil is suitable for a mixture of alfalfa and either orchardgrass or tall fescue. Overgrazing reduces forage yields and causes excessive runoff and erosion. Proper stocking rates and rotation grazing help to keep the pasture in good condition.

If this soil is used as a site for dwellings without basements, the shrink-swell potential is a limitation. Reinforcing foundations, however, helps to prevent the structural damage caused by shrinking and swelling.

The land capability classification is IIe.

134C2—Camden silt loam, 5 to 10 percent slopes, eroded. This moderately sloping, well drained soil is in convex areas on stream terraces. Individual areas are irregular in shape and range from 3 to 35 acres in size.

Typically, the surface layer is brown, friable silt loam. Erosion has reduced the thickness of the original surface layer to about 7 inches. The subsoil is yellowish brown and is about 26 inches thick. The upper part is firm silty clay loam. The next part is firm clay loam. The lower part is friable loam. The underlying material to a depth of 60 inches or more is dark yellowish brown and yellowish brown, stratified loam and fine sandy loam. In some areas the slope is more than 10 percent.

Included with this soil in mapping are small areas where bedrock is within a depth of 4 feet. These areas make up less than 5 percent of the unit.

Water and air move through the upper part of the Camden soil at a moderate rate and through the lower part at a moderate or moderately rapid rate. Surface runoff is medium. Available water capacity is high. The content of organic matter is moderately low. The surface layer tends to crust and puddle after hard rains, especially in areas where subsoil material is mixed into the plow layer. The shrink-swell potential is moderate.

In most areas this soil is used for cultivated crops or pasture. In some areas it is wooded. It is well suited to woodland and pasture and to septic tank absorption fields. It is moderately suited to cultivated crops and to dwellings.

Measures that control water erosion are needed in the areas used for corn, soybeans, or small grain. Examples are a system of conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, and a crop rotation that includes 1 or more years of forage crops. Tilling when the soil is wet causes surface cloddiness and compaction and excessive runoff and water erosion. Returning crop residue to the soil and regularly adding other organic material increase the rate of water infiltration and help to maintain tilth.

Growing grasses and legumes for pasture or hay improves tilth and helps to control erosion. This soil is suitable for a mixture of alfalfa and either orchardgrass or tall fescue. Proper stocking rates, rotation grazing, deferred grazing, and applications of fertilizer help to keep the pasture in good condition.

The main management concern in the areas used as woodland is plant competition, which affects desirable seedlings. The competition from undesirable plants in openings created by timber harvesting can be controlled by chemical or mechanical means. Controlling grazing by livestock helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire help to prevent tree damage and maintain the leaf mulch.

The shrink-swell potential is a limitation if this soil is used as a site for dwellings without basements. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling.

The land capability classification is IIIe.

138—Shiloh silty clay loam. This nearly level, very poorly drained soil is in shallow depressions on uplands. Individual areas are oval or irregularly shaped and range from 3 to 50 acres in size.

Typically, the surface layer is very dark gray, firm silty clay loam about 7 inches thick. The subsurface layer is black, firm silty clay loam about 12 inches thick. The subsoil extends to a depth of more than 60 inches. It is very firm and mottled. The upper part is black silty clay. The next part is very dark gray silty clay. The lower part is dark gray silty clay loam. In some areas the surface layer is lighter in color. In other areas the surface layer contains more clay.

Water and air move through this soil at a slow rate. Surface runoff is very slow or ponded. The seasonal high water table is 1 foot above to 2 feet below the surface during the period March through June in most years. Available water capacity is high. The content of organic matter is high. The surface layer is firm and becomes compacted and cloddy if tilled when too wet. The shrink-swell potential is high.

In most areas this soil is cultivated. It is well suited to cultivated crops. It generally is unsuitable as a site for dwellings and septic tank absorption fields because of the ponding.

Because a drainage system has been installed, this soil can be used for corn, soybeans, and small grain. The drainage system should be maintained, and in some areas additional drainage measures are needed. A combination of random subsurface drains and surface inlets can improve drainage. Soil blowing is a hazard. Leaving crop residue on the surface and establishing field windbreaks help to prevent excessive soil loss. Returning crop residue to the soil, adding other organic material, and keeping tillage to a minimum increase the rate of water infiltration and help to maintain good tilth. Tilling when the soil is too wet causes soil compaction and decreases the rate of water infiltration.

The land capability classification is IIw.

218—Newberry silt loam. This nearly level, poorly drained soil is on broad plains and in wide, shallow depressions on uplands. Individual areas are oval or irregularly shaped and range from 5 to 1,000 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 8 inches thick. The subsurface layer is dark grayish brown, mottled, friable silt loam about 10 inches thick. The subsoil to a depth of more than 60 inches is mottled, firm silty clay loam. The upper part is light brownish gray. The next part is gray. The lower part is grayish brown. In some areas the dark surface layer is more than 10 inches thick. In other areas the subsoil contains more clay.

Included with this soil in mapping are small areas of the somewhat poorly drained Darmstadt and Hoyleton and poorly drained Huey soils. Darmstadt and Huey soils have a light colored surface layer and have a high content of sodium in the subsoil. Darmstadt and Hoyleton soils are on low ridges above the Newberry soil. Huey soils are in positions on broad plains similar to those of the Newberry soil. Included soils make up 5 to 15 percent of the unit.

Water and air move through the Newberry soil at a slow rate. Surface runoff is slow or very slow. The seasonal high water table is within a depth of 2 feet during the period March through June in most years. Available water capacity is very high. The content of organic matter is moderate. The surface layer is friable and can be easily tilled when moist. The shrink-swell potential is moderate.

In most areas this soil is cultivated. It is well suited to cultivated crops. It is poorly suited to dwellings and septic tank absorption fields.

Because a drainage system has been installed, this soil can be used for corn, soybeans, and small grain. The drainage system should be maintained, and in some areas additional drainage measures are needed. A combination of random subsurface drains and surface inlets can improve drainage. Soil blowing is a hazard. Leaving crop residue on the surface and establishing field windbreaks help to prevent excessive soil loss. Returning crop residue to the soil, adding other organic material, and keeping tillage to a minimum increase the rate of water infiltration and help to maintain good tilth. Tilling when the soil is too wet causes soil compaction and decreases the rate of water infiltration.

If this soil is used as a site for dwellings, the seasonal high water table and the high shrink-swell potential are limitations. Backfilling foundation trenches with sand and gravel and reinforcing footings and foundations help to prevent the structural damage caused by shrinking and swelling. Subsurface drains around the footings help to lower the water table. Also, constructing the floor of dwellings without basements at an elevation above the surrounding ground level, grading the site, and diverting surface water reduce the wetness.

The seasonal wetness and the very slow permeability are limitations on sites for septic tank absorption fields. Sewage lagoons function very well on this soil. A septic tank system that includes a sealed sand filter and a

disinfection tank or an evapotranspiration bed also can function satisfactorily.

The land capability classification is IIw.

225—Holton silt loam. This nearly level, somewhat poorly drained soil is on narrow bottom land and in low areas on broad bottom land. It is frequently flooded for brief periods from January through June. Individual areas are long and narrow and range from 10 to 200 acres in size.

Typically, the surface layer is dark grayish brown, mottled, friable silt loam about 10 inches thick. The subsoil is about 26 inches thick. The upper part is dark grayish brown, friable sandy loam. The next part is brown, very friable loamy sand. The lower part is dark grayish brown and grayish brown, mottled, friable loam and silt loam. The underlying material to a depth of 60 inches or more is dark gray, mottled loam. In some places the surface layer has more clay. In other places it is darker. In some areas in the southwestern part of the county, thinly bedded shale and limestone are within a depth of 60 inches. In places the seasonal high water table is within a depth of 1 foot.

Water and air move through this soil at a moderate rate. Surface runoff is very slow. The seasonal high water table is 1 to 3 feet below the surface during the period November through June in most years. Available water capacity is high. The content of organic matter is moderately low. The surface layer is friable and can be easily tilled when moist. The shrink-swell potential is low.

In most areas this soil is cultivated. In some areas it is used as hayland, pasture, or woodland. It is moderately suited to cultivated crops, hay, pasture, and woodland. It generally is unsuitable as a site for dwellings and septic tank absorption fields because of the flooding.

Because a drainage system has been installed, this soil can be used for corn and soybeans. The flooding is a hazard, but it occurs less often than once in 2 years during the growing season. Measures that maintain the drainage system are needed. The wetness can be reduced by surface ditches or subsurface drains. Tilling when the soil is wet causes surface cloddiness and compaction. Minimizing tillage and returning crop residue to the soil help to maintain good tilth and increase the rate of water infiltration.

In the areas used for forage or hay, the flooding is a hazard and the seasonal high water table is a limitation. Dikes and diversions help to control the flooding, and subsurface tile drains lower the water table. Overgrazing causes surface compaction and poor tilth. Proper stocking rates, rotation grazing, restricted use during wet periods, and applications of fertilizer help to keep the pasture in good condition. The flooding delays harvesting of hay in some years.

The main management concern in the areas used as woodland is plant competition, which affects desirable seedlings. The competition from undesirable plants in openings created by timber harvesting can be controlled by chemical or mechanical means. Controlling grazing by livestock helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire help to prevent tree damage and maintain the leaf mulch.

The land capability classification is IIIw.

226—Wirt loam. This nearly level, well drained soil is on bottom land. It is frequently flooded for brief periods from March through May. Individual areas are irregular in shape and range from 5 to 200 acres in size.

Typically, the surface layer is dark brown, friable loam about 8 inches thick. The underlying material extends to a depth of more than 60 inches. The upper part is dark brown and brown, friable silt loam and fine sandy loam. The lower part is brown, friable loam and very friable loamy sand. In some areas the soil is calcareous within a depth of 60 inches. In other areas the surface soil contains more sand.

Included with this soil in mapping are small areas of recent sandy overwash (fig. 6). These areas make up 2 to 5 percent of the unit.

Water and air move through the Wirt soil at a moderate rate. Surface runoff is slow. Available water capacity is high. The content of organic matter is low. The shrink-swell potential is low.

In most areas this soil is cultivated. In some areas it is used as woodland or pasture. It is well suited to cultivated crops and to woodland. It is moderately suited to hay and pasture. Because it is subject to flooding, it generally is unsuitable as a site for dwellings and septic tank absorption fields.

The flooding is a hazard in the areas used as cropland, but it occurs less often than once in 2 years during the growing season. Erosion or scouring during floods is a hazard if the soil is cultivated. Avoiding fall cultivation and establishing or leaving grass strips in critical areas reduces this hazard. Tilling when the soil is wet causes surface cloddiness and compaction. Minimizing tillage and returning crop residue to the soil help to maintain good tilth and increase the rate of water infiltration.

If this soil is used as pasture, overgrazing causes

Figure 6.—Sandy material deposited on the surface of Wirt loam.

surface compaction and poor tilth. Proper stocking rates, rotation grazing, restricted use during wet periods, and applications of fertilizer help to keep the pasture in good condition. The flooding delays harvesting of hay in some years.

The main management concern in the areas used as woodland is plant competition, which affects desirable seedlings. The competition from undesirable plants in openings created by timber harvesting can be controlled by chemical or mechanical means. Controlling grazing by livestock helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire help to prevent tree damage and maintain the leaf mulch.

The land capability classification is IIw.

581—Tamalco silt loam. This nearly level, moderately well drained soil is in convex areas on broad ridges and knolls in the uplands. Individual areas are oblong or irregularly shaped and range from 3 to 50 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 9 inches thick. The subsurface layer is pale brown, friable silt loam about 3 inches thick. The subsoil is about 41 inches thick. It is firm and

mottled. The upper part is brown silty clay. The next part is yellowish brown and light brownish gray silty clay and silty clay loam that has a high content of sodium. The lower part is dark yellowish brown silt loam that has a high content of sodium. The underlying material to a depth of 60 inches or more is light yellowish brown, friable loam. In some areas the surface layer is darker. In other areas there is less clay in the upper part of the subsoil. In places the seasonal high water table is within a depth of 3 feet

Included with this soil in mapping are small areas of the somewhat poorly drained Hoyleton soils. These soils have a darker surface layer than the Tamalco soil. They do not have a high content of sodium in the subsoil. They are in landscape positions similar to those of the Tamalco soil. Included soils make up 5 to 10 percent of the unit.

Water and air move through the Tamalco soil at a very slow rate. Surface runoff is slow. The seasonal high water table is 2.5 to 5.0 feet below the surface during the period February through April in most years. The subsoil has a high content of sodium. Available water capacity is moderate. The content of organic matter is low. The surface layer tends to crust and puddle after hard rains. The shrink-swell potential is high.

In most areas this soil is used for cultivated crops or for hay and pasture. It is moderately suited to cultivated crops, hay, and pasture. It is poorly suited to dwellings and septic tank absorption fields.

In areas used for corn, soybeans, or small grain, the content of sodium in the subsoil results in plant stress in dry periods. The content of sodium reduces the availability and uptake of some plant nutrients. Returning crop residue to the soil and regularly adding other organic material increase the rate of water infiltration and improve tilth. Tilling when the soil is too wet causes the surface layer to become cloddy and increases soil compaction.

Growing grasses and legumes for pasture or hay improves tilth and helps to control erosion. Pasture plants, proper stocking rates, rotation grazing, deferred grazing, and applications of fertilizer help to keep the pasture in good condition.

If this soil is used as a site for dwellings, the seasonal high water table and the high shrink-swell potential are limitations. Backfilling foundation trenches with sand and grave and reinforcing footings and foundations help to prevent the structural damage caused by shrinking and swelling. Subsurface drains around the footings help to lower the water table. Also, constructing the floor of dwellings without basements at an elevation above the surrounding ground level, grading the site, and diverting suface water reduce the wetness. The high content of sodium in the soil will cause difficulty in establishing and maintaining lawns. Selecting salt-tolerant grasses and watering frequently during dry periods help to maintain the quality of the lawn.

The seasonal wetness and the very slow permeability are limitations on sites for septic tank absorption fields. Sewage lagoons function very well on this soil. A septic tank system that includes a sealed sand filter and a disinfection tank or an evapotranspiration bed also can function satisfactorily.

The land capability classification is IIIs.

584B2—Grantfork silty clay loam, 2 to 5 percent slopes, eroded. This gently sloping, somewhat poorly drained soil is on side slopes at the head of small drainageways. Individual areas are irregular in shape and range from 5 to 80 acres in size.

Typically, the surface layer is brown, firm silty clay loam. Erosion has reduced the thickness of the surface layer to about 7 inches. The subsoil extends to a depth of more than 60 inches. It is mottled. The upper part is dark yellowish brown, firm silty clay loam. The next part is grayish brown, firm silty clay loam. The lower part is grayish brown and dark gray, very firm clay loam and has an increased content of sodium. In some areas the surface layer is silt loam.

Included with this soil in mapping are small areas of Darmstadt and Hoyleton soils in landscape positions similar to those of the Grantfork soil. Darmstadt soils have a higher content of sodium in the subsoil than the Grantfork soil. Hoyleton soils have a darker surface layer than the Grantfork soil and a lower content of sodium in the subsoil. Included soils make up 5 to 10 percent of the unit.

Water and air move through the Grantfork soil at a slow rate. Surface runoff is medium. The seasonal high water table is perched at a depth of 1 to 3 feet during the period January through May in most years. Available water capacity is moderate. The content of organic matter is low. The surface layer is firm and sticky when wet and hard and cloddy when dry. It is more difficult to prepare a seedbed in areas of this soil than in the adjacent areas that are uneroded. The shrink-swell potential is moderate.

In most areas this soil is cultivated. It is moderately suited to cultivated crops and pasture. It is poorly suited to dwellings and septic tank absorption fields.

If this soil is used for corn, soybeans, or small grain, further water erosion is a hazard and planting may be

delayed in some years because of wetness. Shallow ditches and random subsurface drains can improve drainage if outlets are available. A system of conservation tillage that leaves crop residue on the surface helps to prevent excessive soil loss. Keeping tillage to a minimum and returning crop residue to the soil or adding other organic material increase the rate of water infiltration and improve tilth. Tilling when the soil is too wet causes the surface layer to become cloddy, increases soil compaction, and causes excessive runoff and water erosion.

Growing grasses and legumes for pasture or hay improves tilth and helps to control erosion. This soil is suitable for a mixture of alfalfa and either orchardgrass or tall fescue. Proper stocking rates, rotation grazing, deferred grazing, and applications of fertilizer help to keep the pasture in good condition.

If this soil is used as a site for dwellings, the seasonal high water table and the high shrink-swell potential are limitations. Backfilling foundation trenches with sand and gravel and reinforcing footings and foundations help to prevent the structural damage caused by shrinking and swelling. Subsurface drains around the footings help to lower the water table. Also, constructing the floor of dwellings without basements at an elevation above the surrounding ground level, grading the site, and diverting surface water reduce the wetness.

The seasonal high water table and the very slow permeability are limitations if this soil is used as a site for septic tank absorption fields. The septic tank system can function satisfactorily if a sealed sand filter and a disinfection tank or an evapotranspiration bed are installed. Sewage lagoons function satisfactorily if the site is leveled.

The land capability classification is IIIe.

620—Darmstadt silt loam. This nearly level, somewhat poorly drained soil is on broad, low ridges in the uplands. Individual areas are irregular in shape and range from 3 to 90 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 11 inches thick. The subsurface layer is grayish brown, friable silt loam about 4 inches thick. The subsoil is about 21 inches thick. It is mottled, firm silty clay loam. The upper part is yellowish brown. The lower part is light brownish gray and has a high content of sodium. The underlying material to a depth of 60 inches or more is light brownish gray, mottled, firm silt loam. In some areas the subsoil has more clay.

Included with this soil in mapping are small areas of the somewhat poorly drained Hoyleton and poorly drained Huey soils. Hoyleton soils have a dark surface layer, have a low sodium content in the subsoil, and are in landscape positions similar to those of the Darmstadt soil. Huey soils are in low areas below the Darmstadt soil. Included soils make up 4 to 15 percent of the unit.

Water and air move through the Darmstadt soil at a very slow rate. Surface runoff is slow. The seasonal high water table is perched at a depth of 1 to 3 feet during the period February through May in most years. The subsoil has a high content of sodium. Available water capacity is moderate. The content of organic matter is low. The surface layer is friable and can be easily tilled when moist. The surface layer tends to crust and puddle after hard rains, especially in areas where the plow layer contains subsoil material and a high amount of sodium. The shrink-swell potential is moderate.

In most areas this soil is cultivated. It is moderately suited to cultivated crops, pasture, and hay. It is poorly suited to dwellings and septic tank absorption fields.

In areas used for soybeans, corn, or small grain, planting may be delayed in some years because of wetness. A combination of shallow ditches and outlets or of random subsurface drains and surface inlets can improve drainage. The subsoil contains high amounts of sodium, which results in moisture stress during dry periods and excess water during wet periods. It also reduces the availability and uptake of some plant nutrients. Water erosion is a hazard in some areas. A system of conservation tillage that leaves crop residue on the surface after planting reduces water erosion. Tilling the soil when wet causes the surface to become cloddy, increases compaction, and causes excessive runoff and erosion. Keeping tillage to a minimum, returning crop residue to the soil, and adding other organic material increase the rate of water infiltration and improve tilth.

If this soil is used as a site for dwellings, the seasonal high water table and the high shrink-swell potential are limitations. Backfilling foundation trenches with sand and gravel and reinforcing footings and foundations help to prevent the structural damage caused by shrinking and swelling. Subsurface drains around the footings help to lower the water table. Also, constructing the floor of dwellings without basements at an elevation above the surrounding ground level, grading the site, and diverting surface water reduce the wetness. The high content of sodium in this soil will cause difficulty in establishing and maintaining lawns. Selecting salt-tolerant grasses and watering frequently during dry periods help to maintain the quality of the lawn.

The seasonal high water table and the very slow permeability are limitations on sites for septic tank absorption fields. Sewage lagoons function very well on this soil. A septic tank system that includes a sealed sand filter and a disinfection tank or an evapotranspiration bed also can function satisfactorily.

The land capability classification is IIIw.

Prime Farmland

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation's short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is the land that is best suited to food, feed, forage, fiber, and oilseed crops. It may be cultivated land, pasture, woodland, or other land, but it is not urban and built-up land or water areas. It either is used for food or fiber crops or is available for those crops. The soil qualities, growing season, and moisture supply are those needed for a well managed soil to produce a sustained high yield of crops in an ecomomic manner. Prime farmland produces the highest yields with minimal expenditure of energy and economic resources, and farming it results in the least damage to the environment.

Prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable. The level of acidity or alkalinity is acceptable. Prime farmland has few or no rocks and is permeable to water and air. It is not excessively erodible or saturated with water for long periods and is not frequently flooded during the growing season. The slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Soil Conservation Service.

About 233,105 acres in Effingham County, or more than 75 percent of the total acreage, meets the requirements for prime farmland. The highest percentage of this land is in the Cisne-Hoyleton-Newberry and Holton-Wirt associations, which are described under the heading "General Soil Map Units." The prime farmland is used for crops, mainly corn, soybeans, and wheat, which account for most of the local agricultural income each year.

A recent trend in land use in some parts of the county has been the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and less productive and cannot be easily cultivated.

The map units in Effingham County that are considered prime farmland are listed in table 5. This list does not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps at the back of this publication. The soil qualities that affect use and management are described under the heading "Detailed Soil Map Units."

Soils that have limitations, such as a seasonal high water table, frequent flooding during the growing season, or inadequate rainfall, qualify for prime farmland only in areas where these limitations have been overcome by such measures as drainage, flood control, or irrigation. The need for these measures is indicated after the map unit name in table 5. Onsite evaluation is needed to determine whether or not these limitations have been overcome by corrective measures.

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help to prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops and Pasture

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed Soil Map Units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

In 1967, about 184,964 acres in Effingham County was cropland and 23,112 acres was pasture *(8)*. The field crops suited to the soils and climate of the county include corn, soybeans, and wheat. A small acreage is planted to grain sorghum. Strawberries are grown commercially in scattered areas.

The soils in the county have good potential for increased production, particularly on the hayland and pasture in the uplands. This soil survey can be used as a guide to the latest management techniques that increase food and fiber production. It provides the resource data necessary for wise land use planning. The paragraphs that follow describe the major management concerns in the county.

Water erosion is the major problem on about 40 percent of the cropland and pasture in Effingham County. It is a hazard if the slope is more than 2 percent. It also can be a hazard if the slope is less than 2 percent and runoff is concentrated.

Sheet erosion, or the loss of the surface layer, is damaging for three reasons. First, the productivity of most soils is reduced as the surface layer is eroded away and the subsoil is incorporated into the plow layer. Loss of the surface layer is especially damaging on soils having a layer that restricts root penetration. The layer in Huey soils that has a high content of sodium is an example.

Second, severe water erosion on sloping soils results in deterioration of tilth in the surface layer and reduces

the rate of water intake. As erosion occurs, the content of clay in the surface layer increases and the soil is more likely to become cloddy if it is worked when wet. Preparing a good seedbed is difficult, and the surface layer tends to crust after hard rains. As a result, the runoff rate is increased.

Third, uncontrolled water erosion results in sedimentation of streams, lakes, rivers, and road ditches. Removing these sediments is expensive. Management that controls water erosion minimizes this pollution and improves water quality for municipal and recreational uses and for fish and wildlife.

A good management system maintains or improves natural fertility, safely removes excess surface water, controls water erosion and soil blowing, and maintains good tilth. Maintaining a plant cover, properly managing crop residue, and reducing the length of slopes help to control water erosion and soil blowing. Also, they increase the rate of water intake and decrease the runoff rate. A cropping system that provides a protective plant cover and that leaves crop residue on the surface during critical rainfall periods helps to control water erosion and maintains the productive capacity of the soil. Including grasses and legumes in the cropping system improves tilth. The legumes provide nitrogen to the following crop.

Contour farming, terraces, and diversions help to control water erosion and reduce the runoff rate. They are effective in areas where slopes are smooth and uniform. The Hoyleton soils on the mound near Altamont are an example.

No-till and mulch-tillage systems help to prevent excessive soil loss, reduce the runoff rate, and increase the rate of water infiltration (fig. 7). They are suitable on most of the tillable soils in the county. They are less effective on nearly level, poorly drained soils, such as Cisne and Wynoose soils.

Soil blowing is a hazard in some areas where the surface is bare. This hazard can be reduced by maintaining a good plant cover and a rough soil surface and by leaving crop residue on the surface. Windbreaks of suitable trees or shrubs also help to control soil blowing.

Improved soil drainage is needed on about 13 percent of the acreage used for crops and pasture in the county. Some soils are naturally so wet that the production of annual crops generally is not possible unless a drainage system is installed. The poorly drained and very poorly drained Cisne, Ebbert, Huey, Newberry, Shiloh, and Wynoose soils generally have been drained and are used for crops.

Unless drained, somewhat poorly drained soils are so wet that in some years crop growth and productivity are reduced. Examples are Bluford and Hoyleton soils on uplands and Holton soils on bottom land. Troublesome seepy spots are common on side slopes in areas of Atlas and Ava soils. A drainage system can improve the productivity of these areas.

The design of surface and subsurface drainage systems varies with the kind of soil. Generally, tile drains are not effective in slowly permeable or very slowly permeable soils, such as Bluford, Cisne, Hoyleton, and Wynoose soils. A surface drainage system, such as by ditching and land leveling, is commonly used to drain excess water from most of the wet soils in the county. Additional care is needed to ensure that the ditches are protected against the deposition of silt.

Droughtiness limits the productivity of some of the soils used for crops and pasture in the county. A high content of exchangeable sodium in Darmstadt, Grantfork, Huey, and Tamalco soils limits the amount of water that is available to plants. Yields of soybeans and grain sorghum are less affected by moisture stress than are yields of corn. Also, winter wheat grows better than corn because it matures in spring, usually before the amount of moisture is insufficient.

Increasing the rate of water infiltration, reducing the runoff rate, and planting drought-tolerant crops help to overcome the adverse effects of droughtiness. Applying a system of conservation tillage, returning crop residue to the soil, adding other organic material, and growing cover crops increase the infiltration rate and reduce the runoff rate.

Soil fertility is naturally low or medium in most of the soils on uplands in the county. Except for the sodium-affected soils, the upland soils are naturally acid. Applying agricultural limestone helps to maintain or raise the pH to a level that is optimum for plant growth.

Corn and wheat respond well to applications of nitrogen fertilizer. Planting legumes, which take nitrogen from the air and, through fixation, add it to the soil, and adding livestock waste add nitrogen to the soil. Most of the soils in the county have a low supply of phosphorus and a low or medium supply of potassium. Adding these elements increases yields. Additions of lime, nitrogen, phosphorus, potassium, and the other elements needed for optimum yields should be based on the results of soil tests. The Cooperative Extension Service can help in determining the kinds and amounts of fertilizer and lime to be applied after tests are made.

Soil tilth is an important factor affecting the germination of seeds, the amount of runoff, and the rate of water infiltration. A surface soil with good tilth is

Figure 7.—No-till soybeans in an area of Hoyleton silt loam, 0 to 2 percent slopes.

granular and porous. In most areas the soils in the county have a surface layer of silt loam. Generally, the structure of this layer is weak. A surface crust forms after periods of intensive rainfall. As a result, the infiltration rate decreases and the runoff rate increases. Including grasses and legumes in the cropping system and regularly adding crop residue, manure, or other organic material improve soil structure and minimize crusting.

Yields Per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 6. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The land capability classification of each map unit also is shown in the table.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents *(5)*. Available yield data from nearby counties and results of field trials and demonstrations also are considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 6 are grown in the survey area, but estimated yields are not listed

because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main hazard is the risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w*, *s*, or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, woodland, wildlife habitat, or recreation.

The capability classification for each map unit is given in the section "Detailed Soil Map Units" and in the yields table.

Woodland Management and Productivity

Hardwoods originally covered slightly less than 50 percent of the county. About 54,500 acres was used as woodland in 1967 *(8)*. This acreage includes two state-owned tracts and areas around lakes that are used as a public water supply. The other wooded areas are privately owned.

The largest areas of woodland are in the Bluford-Hickory-Ava and Holton-Wirt associations (fig. 8), which are described under the heading "General Soil Map Units." The most common desirable trees in the uplands are white oak, red oak, black oak, hickory, and black walnut. The main species on bottom land are cottonwood, pin oak, sycamore, and sweetgum.

Trees have been cleared from the soils suitable for cultivated crops. Most of the remaining areas of woodland are unsuitable for cultivation. These areas are too steep, too wet, or too remote for efficient farming. If properly managed, the soils in the wooded areas have fair to very good potential for trees of high quality.

Much of the woodland can be improved by harvesting mature trees and removing nonmerchantable trees that retard the growth of desirable species. Measures that protect the woodland from fire and from grazing by livestock are essential. Tree planting is needed unless stocking is adequate. Control of competing vegetation is needed if seedlings are planted. Maintaining a cover of grass between rows of seedlings that are planted in bare, sloping areas helps to control erosion. Machinery can be used only if the soil is firm enough to support the weight. If excessive erosion occurs or the slope is

Figure 8.—Yellow poplar and sweetgum in an area of Holton silt loam.

more than 15 percent, runoff should be diverted away from haul roads and skid trails. A surface drainage system is beneficial on wet soils.

Table 7 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for an indicator species. The number indicates the volume, in cubic meters per hectare per year, which the indicator species can produce. The number 1 indicates low potential productivity; 2 and 3, moderate; 4 and 5, moderately high; 6 to 8, high; 9 to 11, very high; and 12 to 39, extremely high. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *R* indicates steep slopes; *X*, stoniness or rockiness; *W*, excess water in or on the soil; *T*, toxic substances in the soil; *D*, restricted rooting depth; *C*, clay in the upper part of the soil; *S*, sandy texture; and *F*, a high content of rock fragments in the soil. The

letter *A* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: R, X, W, T, D, C, S, and F.

In table 7, *slight, moderate*, and *severe* indicate the degree of the major soil limitations to be considered in management.

Erosion hazard is the probability that damage will occur as a result of site preparation and cutting where the soil is exposed along roads, skid trails, fire lanes, and log-handling areas. Forests that have been burned or overgrazed also are subject to erosion. Ratings of the erosion hazard are based on the percent of the slope. A rating of *slight* indicates that no particular prevention measures are needed under ordinary conditions. A rating of *moderate* indicates that erosion-control measures are needed in certain silvicultural activities. A rating of *severe* indicates that special precautions are needed to control erosion in most silvicultural activities.

Equipment limitation reflects the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. The chief characteristics and conditions considered in the ratings are slope, stones on the surface, rock outcrops, soil wetness, and texture of the surface layer. A rating of *slight* indicates that under normal conditions the kind of equipment or season of use is not significantly restricted by soil factors. Soil wetness can restrict equipment use, but the wet period does not exceed 1 month. A rating of *moderate* indicates that equipment use is moderately restricted because of one or more soil factors. If the soil is wet, the wetness restricts equipment use for a period of 1 to 3 months. A rating of *severe* indicates that equipment use is severely restricted either as to the kind of equipment that can be used or the season of use. If the soil is wet, the wetness restricts equipment use for more than 3 months.

Seedling mortality refers to the death of naturally occurring or planted tree seedlings, as influenced by the kinds of soil, soil wetness, or topographic conditions. The factors used in rating the soils for seedling mortality are texture of the surface layer, depth to a seasonal high water table and the length of the period when the water table is high, rock fragments in the surface layer, effective rooting depth, and slope aspect. A rating of *slight* indicates that seedling mortality is not likely to be a problem under normal conditions. Expected mortality is less than 25 percent. A rating of *moderate* indicates that some problems from seedling mortality can be expected. Extra precautions are advisable. Expected mortality is 25 to 50 percent. A rating of *severe* indicates that seedling mortality is a serious problem. Extra precautions are important. Replanting may be necessary. Expected mortality is more than 50 percent.

Windthrow hazard is the likelihood that trees will be uprooted by the wind because the soil is not deep enough to give adequate root anchorage. The main restrictions that affect rooting are a seasonal high water table and the depth to bedrock, a fragipan, or other limiting layers. A rating of *slight* indicates that under normal conditions no trees are blown down by the wind. Strong winds may damage trees, but they do not uproot them. A rating of *moderate* indicates that some trees can be blown down during periods when the soil is wet and winds are moderate or strong. A rating of *severe* indicates that many trees can be blown down during these periods.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index* and as a *volume* number. The site index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

The *volume*, a number, is the yield likely to be produced by the most important trees. This number, expressed as cubic feet per acre per year, indicates the amount of fiber produced in a fully stocked, even-aged, unmanaged stand.

The first species listed under *common trees* for a soil is the indicator species for that soil. It is the dominant species on the soil and the one that determines the ordination class.

Trees to plant are those that are suitable for commercial wood production.

Windbreaks and Environmental Plantings

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, help to keep snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen

houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To ensure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Table 8 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 8 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Soil Conservation Service or the Cooperative Extension Service or from a commercial nursery.

Recreation

The demand for land and facilities for boating, swimming, picnicking, fishing, hunting, hiking, camping, and other forms of outdoor recreation is increasing throughout the county. Several publicly owned and privately owned tracts are available for recreational uses. The Rock Cave Nature Area, the Wildcat Hollow Conservation Area, the Effingham Water Authority areas at CIPS Lake and Lake Sara, the Altamont Reservoir area, and several city parks provide most of the public recreational facilities. Privately owned recreational facilities include campgrounds, golf courses, farm ponds, and hunting areas. An Illinois native prairie preserve is maintained adjacent to the Illinois Central Railroad right-of-way from Watson to the south county line.

The potential for further recreational development is good throughout the county. The soils with the best potential are in the Bluford-Hickory-Ava association, which is described in the section "General Soil Map Units."

The soils of the survey area are rated in table 9 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation also are important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 9, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 9 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 12 and interpretations for dwellings without basements and for local roads and streets in table 11.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones on the surface.

Golf fairways are subject to heavy foot traffic and

some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife Habitat

Effingham County provides a variety of habitats for wildlife, including forests, pasture, and open fields. The habitat can be improved in most areas by providing food, cover, and water. The following paragraphs specify, by the soil associations described under the heading "General Soil Map Units," the kinds of habitat in two wildlife areas in Effingham County and the kinds of wildlife in those areas.

Wildlife area 1.—This wildlife area consists of the Cisne-Hoyleton-Newberry association. The soils are nearly level and gently sloping and are poorly drained or somewhat poorly drained. This area is used mainly as cropland. The chief crops are corn and soybeans. Winter wheat also is grown. Many areas are fall plowed. The habitat is generally of poor quality because of a scarcity of crop residue, herbaceous nesting and roosting cover, woody cover, and travel lanes or hedgerows. The habitat can be improved by a delay in mowing the grassy cover on roadsides, ditchbanks, and waterways until after the nesting season; protection of the existing woody cover; wildlife plantings around ponds; field windbreaks; and proper management of crop residue. The wildlife in this area include ring-necked pheasant, mourning dove, cottontail rabbit, and a few white-tailed deer. Nongame species include several song birds, a few reptiles, and furbearers.

Wildlife area 2.—This wildlife area consists of the Bluford-Hickory-Ava and Holton-Wirt associations. The soils are nearly level to steep and are somewhat poorly drained to well drained. The habitat in this area is more diverse than that in wildlife area 1. It consists of cropland, pasture, and woodland. As a result, the habitat favors a greater variety of wildlife. The major game species are white-tailed deer, bobwhite quail, ring-necked pheasant, fox squirrel, and gray squirrel. The nongame species include furbearers, reptiles, and many songbirds. Lakes and farm ponds are inhabited by largemouth bass, bluegill, and channel catfish. The Little Wabash River is inhabited by catfish, striped bass, and rough fish. Migratory waterfowl, such as geese and ducks, use the water areas as resting sites and the nearby fields for feeding. Good pasture management, proper management of crop residue, and measures that protect the wooded areas from fire and from grazing by livestock can significantly improve the habitat.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 10, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture also are considerations. Examples of grain and seed crops are soybeans, corn, and wheat.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available

water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture also are considerations. Examples of grasses and legumes are fescue, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture also are considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, wheatgrass, and grama.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of these plants are oak, poplar, cherry, sweetgum, apple, hawthorn, dogwood, hickory, and blackberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are Russian olive, autumn olive, and crabapple.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, saltgrass, cordgrass, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. Wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, field sparrow, cottontail, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include thrushes, woodpeckers, squirrels, gray fox, raccoon, and deer.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the

potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 11 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and *small commercial buildings* are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, slope, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year (fig. 9). They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. The depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic-supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 12 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or

Figure 9.—A road damaged by flooding in an area of Holton soils.

maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 12 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils

rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, and flooding affect absorption of the effluent. Large stones interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 12 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site. The landfill must be able to bear heavy vehicular traffic. Ground-water pollution is a risk. Ease of excavation and revegetation needs to be considered.

The ratings in table 12 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 13 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low

embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and the shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. These soils may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 13, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 14 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and for embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning,

design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential (fig. 10) in the upper 60 inches. The seepage potential is determined by the permeability in the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

Figure 10.—A farm pond in an area of Atlas soils. Seepage is very slow in these soils.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to control erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of soil blowing or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of soil blowing, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics. These results are reported in table 18.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

Table 15 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil Series and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system *(3)* and the system adopted by the American Association of State Highway and Transportation Officials *(2)*.

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates

determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table

Physical and Chemical Properties

Table 16 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

The shrink-swell potential classes are based on the

change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeablity. Values of K range from 0.05 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to soil blowing in cultivated areas. The groups indicate the susceptibility to soil blowing. Soils are grouped according to the following distinctions:

1. Coarse sands, sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.

2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, and sapric soil material. These soils are very highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

4L. Calcareous loams, silt loams, clay loams, and silty clay loams. These soils are erodible. Crops can be grown if intensive measures to control soil blowing are used.

4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control soil blowing are used.

5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material. These soils are slightly erodible. Crops can be grown if measures to control soil blowing are used.

6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay. These soils are very slightly erodible. Crops can be grown if ordinary measures to control soil blowing are used.

7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material. These soils are very slightly erodible. Crops can be grown if ordinary measures to control soil blowing are used.

8. Soils that are not subject to soil blowing because of coarse fragments on the surface or because of surface wetness.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 16, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 17 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the infiltration of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate

(high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to two hydrologic groups in table 17, the first letter is for drained areas and the second is for undrained areas.

Flooding, the temporary inundation of an area, is caused by overflowing streams or by runoff from adjacent slopes. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 17 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *occasional* that it occurs, on the average, once or less in 2 years; and *frequent* that it occurs, on the average, more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 17 are the depth to the seasonal high water table; the kind of water table—that is, perched or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 17.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion also is expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Engineering Index Test Data

Table 18 shows laboratory test data for several pedons sampled at carefully selected sites in the survey area. The pedons are representative of the series described in the section "Soil Series and Their Morphology." The soil samples were tested by the Illinois Department of Transportation.

The testing methods generally are those of the American Association of State Highway and Transportation Officials (AASHTO) or the American Society for Testing and Materials (ASTM).

The tests and methods are AASHTO classification—M 145 (AASHTO), D 3282 (ASTM); Unified classification—D 2487 (ASTM); Mechanical analysis—T 88 (AASHTO), D 2217 (ASTM); Liquid limit—T 89 (AASHTO), D 423 (ASTM); Plasticity index—T 90 (AASHTO), D 424 (ASTM); and Moisture density, Method A—T 99 (AASHTO), D 698 (ASTM).

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories *(18)*. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 19 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Eleven soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Alfisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Udalf (*Ud*, meaning humid, plus *alf*, from Alfisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Hapludalfs (*Hapl*, meaning minimal horizonation, plus *udalfs*, the suborder of the Alfisols that has a udic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Hapludalfs.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-silty, mixed, mesic Typic Hapludalfs.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the underlying material can differ within a series.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the *Soil Survey Manual (17)*. Many of the technical terms used in the descriptions are defined in *Soil Taxonomy (18)*. Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

Atlas Series

The Atlas series consists of somewhat poorly drained, very slowly permeable soils on side slopes in the uplands. These soils formed in till that has a paleosol. Slope ranges from 4 to 12 percent.

Atlas soils are similar to Bluford soils and commonly are adjacent to Bluford, Hickory, and Wynoose soils. Bluford soils and the poorly drained Wynoose soils formed in loess and Illinoian sediments. They are on ridges and in nearly level areas above the Atlas soils. The well drained Hickory soils formed in Illinoian till. They are on side slopes below the Atlas soils.

Typical pedon of Atlas silt loam, 4 to 12 percent slopes, eroded, 260 feet north and 425 feet east of the southwest corner of sec. 35, T. 6 N., R. 5 E.

Ap—0 to 6 inches; brown (10YR 5/3) silt loam; few fine faint dark grayish brown (10YR 4/2) mottles; weak coarse granular structure; friable; many fine and few medium roots; very strongly acid; clear smooth boundary.

Btg1—6 to 10 inches; grayish brown (10YR 5/2) silty clay loam; moderate fine subangular blocky structure; firm; common fine and few medium roots; few faint brown (10YR 5/3) clay films on faces of peds; few fine concretions of iron and manganese oxide; few very fine pebbles; very strongly acid; clear smooth boundary.

Btg2—10 to 17 inches; grayish brown (10YR 5/2) clay loam; few fine distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; very firm; few fine and medium roots; few faint brown (10YR 5/3) clay films on faces of peds; few fine concretions of iron and manganese oxide; few very fine pebbles; very strongly acid; gradual smooth boundary.

Btg3—17 to 34 inches; grayish brown (10YR 5/2) clay loam; common coarse distinct yellowish brown (10YR 5/6) mottles; moderate coarse subangular blocky structure parting to strong medium subangular blocky; firm; few fine roots; common distinct brown (10YR 5/3) mottles on faces of peds and in root channels; common fine accumulations of iron and manganese oxide on faces of peds; very strongly acid; gradual wavy boundary.

Btg4—34 to 47 inches; light brownish gray (10YR 6/2) clay loam; many coarse distinct yellowish brown (10YR 5/6) mottles; moderate coarse subangular blocky structure; firm; few fine roots; few distinct dark grayish brown (10YR 4/2) and common faint brown (10YR 5/3) clay films on faces of peds; few fine concretions and few coarse accumulations of iron and manganese oxide; few coarse and few fine pebbles; very strongly acid; gradual irregular boundary.

BCg—47 to 60 inches; light brownish gray (10YR 6/2) loam; few coarse distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; firm; few distinct gray (10YR 5/1) clay films on faces of peds; few fine concretions of iron and manganese oxide; few fine, medium, and coarse pebbles; medium acid.

The thickness of the solum ranges from 42 to more than 60 inches. Depth to the Sangamon paleosol is less than 20 inches. The content of clay in the argillic horizon ranges from 35 to 45 percent.

The Ap horizon has chroma of 2 or 3. It is commonly silt loam, but the range includes loam, clay loam, and silty clay loam. The Bt horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 3. It is clay loam, clay, or silty clay loam.

Atlas silty clay loam, 4 to 12 percent slopes, severely eroded, has less clay in the control section than is definitive for the Atlas series. This difference, however, does not significantly affect the use and management of the soil.

Ava Series

The Ava series consists of moderately well drained soils on convex ridgetops and side slopes in the uplands. These soils formed in loess and in the underlying silty or loamy deposits at the surface of the Illinoian till plain. Permeability is moderate in the upper part of the profile, moderately slow in the next part, and very slow in the lower part. Slope ranges from 1 to 12 percent.

The Ava soils in this county are taxadjuncts to the series because they do not have a fragipan within a depth of 40 inches. This difference, however, does not significantly affect use and management of the soils.

Ava soils are similar to Camden and Parke soils and are commonly adjacent to Atlas, Bluford, Hickory, and Parke soils. Atlas and Bluford soils are somewhat poorly drained. Atlas soils formed dominantly in glacial till. They are on side slopes below the Ava soils. Bluford soils are in the broader, less sloping areas. Camden soils formed in loess and outwash. Hickory soils formed in glacial till. They are on side slopes below the Ava soils. Parke soils are well drained and are on the higher ridgetops. They have more sand in the lower part than the Ava soils.

Typical pedon of Ava silt loam, 1 to 5 percent slopes, 200 feet north and 650 feet east of the southwest corner of sec. 35, T. 6 N., R. 5 E.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine and medium granular structure; friable; common coarse and fine roots; strongly acid; clear smooth boundary.

E—9 to 15 inches; dark yellowish brown (10YR 4/4) silt loam; few medium faint dark grayish brown (10YR 4/2) mottles; moderate fine and medium granular structure; friable; common fine and medium roots; very few fine and medium concretions of iron and manganese oxide; very strongly acid; clear smooth boundary.

Bt1—15 to 24 inches; yellowish brown (10YR 5/4) silty clay loam; common medium faint yellowish brown (10YR 5/6) mottles; moderate fine subangular blocky structure; friable; common fine roots; common faint yellowish brown (10YR 5/4) clay films on faces of peds; very strongly acid; gradual smooth boundary.

Bt/E—24 to 28 inches; pale brown (10YR 6/3) silty clay loam (Bt); common medium prominent strong brown (7.5YR 5/6) mottles; moderate coarse subangular blocky structure parting to moderate medium subangular blocky; firm; few fine roots; common distinct brown (10YR 5/3) clay films on faces of peds; few fine concretions of iron and manganese oxide; many prominent light gray (10YR 7/2 dry) silt coatings on faces of peds (E); very few fine pebbles; very strongly acid; gradual smooth boundary.

B't1—28 to 38 inches; brown (10YR 5/3) silty clay loam; many medium prominent strong brown (7.5YR 5/8) mottles; moderate coarse subangular blocky structure; firm; few fine roots; common prominent grayish brown (10YR 5/2) clay films on faces of peds; very strongly acid; gradual smooth boundary.

2B't2—38 to 48 inches; grayish brown (10YR 5/2) silty clay loam; common medium distinct yellowish brown (10YR 5/8) mottles; strong coarse subangular blocky structure; very firm; very few fine roots; many prominent grayish brown (10YR 5/2) clay films on faces of peds and common prominent dark grayish brown (10YR 4/2) clay films along root channels; few fine concretions of iron and manganese oxide; strongly acid; gradual smooth boundary.

2Btx—48 to 60 inches; grayish brown (10YR 5/2) silt loam; many fine and medium distinct yellowish brown (10YR 5/8) mottles; strong coarse subangular blocky structure, very firm; very few fine roots; common prominent grayish brown (10YR 5/2) clay films on faces of peds and common prominent dark grayish brown (10YR 4/2) clay films along root channels; many fine concretions of iron and manganese oxide; few coarse accumulations of iron and manganese oxide; few fine pebbles; neutral.

The thickness of the solum ranges from 40 to more than 60 inches. The thickness of the loess ranges from 30 to 45 inches. The content of clay in the argillic horizon ranges from 27 to 32 percent.

The Ap horizon has value of 4 or 5 and chroma of 2 or 3. It is silt loam or silty clay loam. The E horizon has value of 4 or 5 and chroma of 3 to 6. Some pedons in cultivated areas do not have an E horizon. The Bt horizon has hue of 10YR or 7.5YR and value and chroma of 4 to 6. The 2C horizon, if it occurs, is silt loam, loam, or clay loam.

Bluford Series

The Bluford series consists of somewhat poorly drained, slowly permeable soils on broad ridges in the uplands. These soils formed in loess and in the underlying sediments at the surface of the Illinoian till plain. Slope ranges from 0 to 5 percent.

Bluford soils are similar to Atlas and Hoyleton soils and commonly are adjacent to Atlas, Ava, Hickory, and Wynoose soils. Atlas soils formed dominantly in glacial till. They are on side slopes below the Bluford soils. The moderately well drained Ava soils are on the higher ridges. The well drained Hickory soils formed in glacial till. They are on side slopes below the Bluford soils. Hoyleton soils have a surface layer with moist value of 3 or less. The poorly drained Wynoose soils are on broad plains below the Bluford soils.

Typical pedon of Bluford silt loam, 0 to 2 percent slopes, 1,420 feet south and 945 feet west of the northeast corner of sec. 36, T. 8 N., R. 5 E.

Ap—0 to 9 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate fine granular structure; friable; common roots; neutral; abrupt smooth boundary.

E—9 to 12 inches; pale brown (10YR 6/3) silt loam; common fine distinct yellowish brown (10YR 5/6) mottles; moderate medium granular structure; friable; few roots; common very fine black (N 2/0) accumulations of iron and manganese oxide; strongly acid; clear smooth boundary.

Bt/E—12 to 19 inches; brown (10YR 5/3) silty clay loam (Bt); common medium distinct yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; firm; few roots; many distinct grayish brown (10YR 5/2) clay films on faces of peds; many prominent light gray (10YR 7/1 dry) uncoated silt grains on faces of peds (E); few fine black (N 2/0) concretions of iron and manganese oxide; very strongly acid; abrupt smooth boundary.

Bt1—19 to 28 inches; brown (10YR 5/3) silty clay; many medium prominent strong brown (7.5YR 5/8) mottles; strong coarse subangular blocky structure; firm; few roots; many distinct dark grayish brown (10YR 4/2) clay films in root channels; common distinct light gray (10YR 7/1 dry) uncoated silt grains on faces of peds; few fine black (N 2/0) accumulations of iron and manganese oxide; very strongly acid; clear smooth boundary.

Bt2—28 to 37 inches; brown (10YR 5/3) silty clay loam; many fine and medium prominent strong brown (7.5YR 5/8) mottles; moderate medium subangular blocky structure; firm; few roots; many prominent dark grayish brown (10YR 4/2) clay films on faces of peds; common fine black (N 2/0) accumulations of iron and manganese oxide; few pebbles; very strongly acid; clear smooth boundary.

Bt3—37 to 43 inches; brown (10YR 5/3) silty clay loam; many fine distinct yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; firm; many distinct dark grayish brown (10YR 4/2) clay films on faces of peds; few fine black (N 2/0) accumulations of iron and manganese oxide; very strongly acid; clear smooth boundary.

2Btx1—43 to 55 inches; light brownish gray (10YR 6/2) silty clay loam; many medium and coarse distinct yellowish brown (10YR 5/8) mottles; weak fine and medium subangular blocky structure; firm; common prominent brown (10YR 4/3) clay films on faces of peds; few fine black (N 2/0) accumulations of iron and manganese oxide; few fine pebbles; very strongly acid; clear smooth boundary.

2Btx2—55 to 60 inches; light brownish gray (10YR 6/2) loam; many coarse distinct yellowish brown (10YR 5/8) mottles; weak medium subangular blocky structure; firm; few faint dark grayish brown (10YR 4/2) clay films on faces of peds; few fine black (N 2/0) accumulations of iron and manganese oxide; few fine pebbles; very strongly acid.

The thickness of the solum ranges from 40 to more than 60 inches. The thickness of the loess ranges from 30 to 45 inches. The content of clay in the argillic horizon ranges from 35 to 42 percent.

The Ap horizon has value of 4 or 5 and chroma of 2 or 3. The E horizon has value of 5 or 6 and chroma of 2 to 4. Some pedons do not have an E horizon. The Bt horizon has value of 4 to 6 and chroma of 2 to 6. The 2Btx horizon has value of 4 to 6 and chroma of 2 to 8. It is loam, silty clay loam, or clay loam.

Camden Series

The Camden series consists of well drained soils on stream terraces. These soils formed in silty material and in the underlying stratified, loamy material. Permeability is moderate in the upper part of the profile and moderate or moderately rapid in the lower part. Slope ranges from 1 to 10 percent.

Camden soils are similar to Ava, Hickory, and Parke soils and commonly are adjacent to Hickory, Holton, and Wirt soils. Ava soils formed in loess and have fragic soil properties in the lower part of the solum. Hickory soils formed in glacial till. They are on side slopes above the Camden soils. Parke soils formed in loess and are not stratified in the lower part of the solum. The somewhat poorly drained Holton and Wirt soils are on bottom land below the Camden soils.

Typical pedon of Camden silt loam, 1 to 5 percent slopes, 150 feet south and 212 feet east of the center of sec. 30, T. 9 N., R. 6 E.

Ap—0 to 8 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate fine granular structure; friable; common roots; strongly acid; abrupt smooth boundary.

E—8 to 11 inches; yellowish brown (10YR 5/4) silt loam; moderate medium granular structure; friable; common roots; strongly acid; clear smooth boundary.

Bt1—11 to 15 inches; yellowish brown (10YR 5/4) silty clay loam; moderate medium subangular blocky structure; firm; few roots; many distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; strongly acid; gradual smooth boundary.

Bt2—15 to 24 inches; yellowish brown (10YR 5/4) silty clay loam; moderate coarse subangular blocky structure parting to moderate medium subangular blocky; firm; few distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; few very fine black (N 2/0) accumulations of iron and manganese oxide; strongly acid; gradual smooth boundary.

2Bt3—24 to 34 inches; yellowish brown (10YR 5/4) clay loam; common coarse distinct pale brown (10YR

6/3) mottles; moderate coarse subangular blocky structure; firm; few roots; many distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; few very fine black (N 2/0) accumulations of iron and manganese oxide; medium acid; gradual smooth boundary.

2Bt4—34 to 40 inches; light yellowish brown (10YR 6/4) fine sandy loam; weak coarse subangular blocky structure; firm; few roots; many faint dark yellowish brown (10YR 4/4) clay films on faces of peds; few very fine black (N 2/0) accumulations of iron and manganese oxide; medium acid; clear smooth boundary.

2Bt5—40 to 43 inches; light yellowish brown (10YR 6/4) silt loam; weak coarse subangular blocky structure; firm; few roots; many faint dark yellowish brown (10YR 4/4) clay films on faces of peds; strongly acid; clear smooth boundary.

2Bt6—43 to 49 inches; light yellowish brown (10YR 6/4) loam; weak coarse subangular blocky structure; firm; few roots; many faint dark yellowish brown (10YR 4/4) clay films on faces of peds; medium acid; clear smooth boundary.

2BC—49 to 60 inches; light yellowish brown (10YR 6/4) sandy loam; single grain; friable; many faint dark yellowish brown (10YR 4/4) clay films on faces of peds; medium acid.

The thickness of the solum ranges from 40 to 65 inches. The thickness of the overlying silty material ranges from 24 to 40 inches.

The Ap horizon has value of 4 or 5 and chroma of 2 or 3. The E horizon has value of 4 to 6 and chroma of 2 to 4. Some pedons do not have an E horizon. The Bt and 2Bt horizons have hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 3 to 6. The 2BC horizon is silt loam, loam, or sandy loam. Some pedons have a 2C horizon, which is stratified fine sandy loam to silt loam.

Camden silt loam, 5 to 10 percent slopes, eroded, has more sand in the control section than is definitive for the series. This difference, however, does not significantly affect the use and management of the soil.

Cisne Series

The Cisne series consists of poorly drained, very slowly permeable soils on broad plains in the uplands. These soils formed in loess and in the underlying sediments at the surface of the Illinoian till plain. Slope ranges from 0 to 2 percent.

Cisne soils are similar to Wynoose soils and commonly are adjacent to Darmstadt, Ebbert, Hoyleton, Huey, and Newberry soils. The somewhat poorly drained Darmstadt and Hoyleton soils are on ridges above the Cisne soils. Ebbert soils have a mollic epipedon. They are in shallow depressions below the Cisne soils. Huey soils have a light colored surface layer. They are in positions on the landscape similar to those of the Cisne soils. Newberry soils have less clay in the subsoil than the Cisne soils. They are in wide depressions below the Cisne soils. Wynoose soils have an Ap horizon with moist value of 4 or more.

Typical pedon of Cisne silt loam, 1,495 feet south and 740 feet west of the northeast corner of sec. 6, T. 7 N., R. 4 E.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) s lt loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; common fine roots; few fine black (N 2/0) concretions of iron and manganese oxide; neutral; abrupt smooth boundary.

E—8 to 16 inches; light brownish gray (10YR 6/2) silt loam; common coarse distinct dark grayish brown (10YR 4/2) and few fine distinct yellowish brown (10YR 5/6) mottles; weak medium platy structure parting to moderate fine granular; friable; common fine roots; medium acid; clear smooth boundary.

Bt/E—16 to 18 inches; grayish brown (2.5Y 5/2) silty clay loam (Bt); few fine distinct light olive brown (2.5Y 5/6) mottles; moderate medium subangular blocky structure; firm; few fine roots; few faint dark grayish brown (2.5Y 4/2) clay films in root channels; many prominent light gray (10YR 7/2) faces of peds (E); very strongly acid; clear smooth boundary.

Btg1—18 to 25 inches; grayish brown (2.5Y 5/2) silty clay loam; common fine prominent strong brown (7.5YR 5/6) mottles; strong coarse subangular blocky structure; firm; few fine roots; many distinct very dark grayish brown (10YR 3/2) clay films on faces of peds; strongly acid; gradual smooth boundary.

Btg2—25 to 45 inches; grayish brown (2.5Y 5/2) silty clay loam; few medium and coarse prominent strong brown (7.5YR 5/6) mottles; moderate coarse subangular blocky structure; firm; few fine roots; common distinct very dark grayish brown (10YR 3/2) clay films on faces of peds; strongly acid; gradual smooth boundary.

2Btg3—45 to 49 inches; grayish brown (2.5Y 5/2) silty clay loam; few medium distinct light olive brown (2.5Y 5/6) mottles; weak coarse subangular blocky structure; firm; few distinct dark grayish brown (2.5Y 4/2) clay films on faces of peds; few fine black (N 2/0) accumulations of iron and manganese oxide;

medium acid; clear smooth boundary.

2BCg—49 to 60 inches; dark grayish brown (10YR 4/2) clay loam; common coarse distinct yellowish brown (10YR 5/6) mottles; weak moderate subangular blocky structure; firm; few distinct very dark grayish brown (10YR 3/2) clay films on faces of peds; few fine black (N 2/0) accumulations of iron and manganese oxide; medium acid.

The thickness of the solum ranges from 40 to 65 inches. The thickness of the loess ranges from 30 to 55 inches. The content of clay in the argillic horizon ranges from 35 to 45 percent.

The Ap horizon has value of 2 or 3 and chroma of 1 or 2. The E horizon has value of 5 to 7 and chroma of 1 or 2. The Btg horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 or 2. It has mottles with higher chroma. It is silty clay loam or silty clay. The 2BCg horizon is clay loam, silty clay loam, loam, or silt loam.

Darmstadt Series

The Darmstadt series consists of somewhat poorly drained, very slowly permeable soils on broad plains in the uplands. These soils formed in loess. Slope ranges from 0 to 2 percent.

Darmstadt soils are similar to Grantfork and Huey soils and commonly are adjacent to Atlas, Cisne, Hoyleton, and Newberry soils. The adjacent soils do not have a natric horizon. Atlas soils are on side slopes along drainageways below the Darmstadt soils. Cisne, Hoyleton, and Huey soils are in landscape positions similar to those of the Darmstadt soils. Huey soils are poorly drained. Grantfork soils formed in loamy erosional sediments and glacial till. Newberry soils are in the lower areas.

Typical pedon of Darmstadt silt loam, 1,320 feet north and 1,300 feet west of the center of sec. 28, T. 9 N., R. 4 E.

Ap—0 to 11 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; common fine roots; 0.9 percent exchangeable sodium; slightly acid; abrupt smooth boundary.

E—11 to 15 inches; grayish brown (10YR 5/2) silt loam; moderate medium granular structure; friable; few fine roots; few medium and coarse black (N 2/0) concretions of iron and manganese oxide; 1.9 percent exchangeable sodium; medium acid; abrupt smooth boundary.

Bt1—15 to 22 inches; yellowish brown (10YR 5/4) silty clay loam; few fine distinct strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; firm; many prominent grayish brown (10YR 5/2) clay films on faces of peds; few fine black (N 2/0) accumulations of iron and manganese oxide; about 12 percent exchangeable sodium; slightly acid; clear smooth boundary.

Bt2—22 to 27 inches; yellowish brown (10YR 5/4) silty clay loam; common medium distinct strong brown (7.5YR 5/8) mottles; moderate medium subangular blocky structure; firm; many distinct grayish brown (10YR 5/2) clay films on faces of peds; few medium black (N 2/0) accumulations of iron and manganese oxide; 12.2 percent exchangeable sodium; neutral; clear smooth boundary.

Btg—27 to 36 inches; light brownish gray (10YR 6/2) silty clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; few distinct grayish brown (10YR 5/2) clay films and common distinct white (10YR 8/1 dry) silt coatings on faces of peds; few medium black (N 2/0) accumulations of iron and manganese oxide; 15.8 percent exchangeable sodium; moderately alkaline; clear smooth boundary.

Cg—36 to 60 inches; light brownish gray (10YR 6/2) silt loam; many coarse yellowish brown (10YR 5/6) mottles; massive; firm; few fine black (N 2/0) accumulations of iron and manganese oxide; 12.6 percent exchangeable sodium; moderately alkaline.

The thickness of the solum ranges from 35 to 60 inches. Depth to the natric horizon ranges from 10 to 30 inches. The content of clay in the argillic horizon ranges from 27 to 35 percent.

The Ap horizon has value of 3 to 6 and chroma of 2 or 3. The E horizon has value of 4 to 6 and chroma of 2 to 4. Some pedons do not have an E horizon. The Bt horizon has value of 4 to 7 and chroma of 1 to 4.

Ebbert Series

The Ebbert series consists of poorly drained and very poorly drained, slowly permeable soils in depressions on uplands. These soils formed in loess. Slope ranges from 0 to 2 percent.

Ebbert soils are similar to Newberry soils and commonly are adjacent to Cisne, Darmstadt, Newberry, and Shiloh soils. Cisne, Darmstadt, and Newberry soils do not have a mollic epipedon. They are on nearly level plains above the Ebbert soils. Shiloh soils do not have an E horizon and have a higher content of clay

throughout than the Ebbert soils. They are in the slightly lower areas.

Typical pedon of Ebbert silt loam, 600 feet north and 50 feet west of the southeast corner of sec. 1, T. 8 N., R. 7 E.

Ap—0 to 7 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; few medium distinct yellowish brown (10YR 5/6) mottles; moderate fine granular structure; friable; slightly acid; clear smooth boundary.

A—7 to 13 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; few medium distinct yellowish brown (10YR 5/4) mottles; moderate medium granular structure; friable; medium acid; clear smooth boundary.

Eg—13 to 22 inches; dark gray (10YR 4/1) silt loam, light gray (10YR 6/1) dry; common medium distinct yellowish brown (10YR 5/6) mottles; weak medium platy structure parting to weak very fine subangular blocky; friable; strongly acid; clear smooth boundary.

Btg1—22 to 30 inches; dark gray (10YR 4/1) silty clay loam; common fine distinct yellowish brown (10YR 5/4) mottles; moderate fine and medium angular blocky structure; firm; many distinct very dark gray (10YR 3/1) clay films on faces of peds; medium acid; gradual smooth boundary.

Btg2—30 to 40 inches; dark gray (10YR 4/1) silty clay loam; many fine and medium distinct yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate fine angular blocky; firm; common distinct very dark gray (10YR 3/1) clay films on faces of peds; medium acid; clear wavy boundary.

Btg3—40 to 48 inches; grayish brown (2.5Y 5/2) silty clay loam; few fine prominent yellowish red (5YR 4/8) and many fine prominent yellowish brown (10YR 5/8) mottles; weak and moderate medium subangular blocky structure; friable; common distinct very dark gray (10YR 3/1) clay films on faces of peds; medium acid; clear wavy boundary.

2Cg—48 to 60 inches; gray (10YR 5/1) silty clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; massive; very firm; about 10 percent sand; slightly acid.

The thickness of the solum ranges from 45 to more than 60 inches. The thickness of the mollic epipedon ranges from 10 to 17 inches. The content of clay in the argillic horizon ranges from 24 to 35 percent.

The Ap horizon has value of 2 or 3 and chroma of 1 or 2. It is dominantly silt loam but is silty clay loam in some pedons. The Btg horizon has hue of 10YR, 2.5Y, or 5Y. It is dominantly silty clay loam, but in some pedons it has subhorizons of silt loam. The 2Cg horizon is silty clay loam, loam, or clay loam.

Grantfork Series

The Grantfork series consists of somewhat poorly drained, slowly permeable soils on side slopes along small drainageways. These soils formed in loamy erosional sediments and glacial till. Slope ranges from 2 to 5 percent.

Grantfork soils are similar to Darmstadt soils and commonly are adjacent to Atlas, Cisne, Darmstadt, and Newberry soils. Atlas soils formed in glacial till and have more clay in the solum than the Grantfork soils. They are downslope from the Grantfork soils. The poorly drained Cisne and Newberry soils are in the less sloping areas. Darmstadt soils have a natric horizon. They are in landscape positions similar to those of the Grantfork soils.

Typical pedon of Grantfork silty clay loam, 2 to 5 percent slopes, eroded, 2,430 feet north and 110 feet west of the southeast corner of sec. 3, T. 7 N., R. 4 E.

Ap—0 to 7 inches; brown (10YR 4/3) silty clay loam, pale brown (10YR 6/3) dry; weak fine and medium subangular blocky structure; firm; common fine roots; neutral; abrupt smooth boundary.

Bt—7 to 11 inches; dark yellowish brown (10YR 4/4) silty clay loam; many medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; few fine roots; common distinct grayish brown (10YR 5/2) clay films on faces of peds; neutral; clear smooth boundary.

Btg1—11 to 19 inches; grayish brown (10YR 5/2) silty clay loam; few fine distinct yellowish brown (10YR 5/6) and common medium distinct yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; firm; few fine roots; common distinct dark grayish brown (10YR 4/2) clay films on faces of peds; neutral; clear smooth boundary.

Btg2—19 to 30 inches; grayish brown (2.5Y 5/2) silty clay loam; few fine prominent yellowish brown (10YR 5/6) mottles; moderate medium angular blocky structure; firm; few fine roots; many distinct grayish brown (10YR 5/2) clay films on faces of peds; moderately alkaline; abrupt smooth boundary.

2Btg3—30 to 48 inches; grayish brown (2.5Y 5/2) clay loam; few fine faint olive brown (2.5Y 4/4) mottles;

moderate medium angular blocky structure; very firm; many distinct dark grayish brown (10YR 4/2) clay films on faces of peds; few fine pebbles; few fine black (N 2/0) concretions of iron and manganese oxide; moderately alkaline; gradual smooth boundary.

2Btg4—48 to 60 inches; dark gray (10YR 4/1) clay loam; few fine distinct yellowish brown (10YR 5/6) mottles moderate medium angular blocky structure; very firm; many prominent dark gray (10YR 4/1) and few prominent very dark gray (10YR 3/1) clay films on faces of peds; few fine and medium pebbles; few fine black (N 2/0) concretions of iron and manganese oxide; moderately alkaline.

The thickness of the solum ranges from 45 to more than 60 inches. The depth to glacial till ranges from 24 to 40 inches. The content of exchangeable sodium is 10 to 15 percent in one or more of the horizons between depths of 10 and 40 inches.

The Ap horizon has value of 3 or 4 and chroma of 2 or 3. It is silty clay loam or silt loam. The Bt horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 4. The 2Btg horizon is clay loam or loam.

Hickory Series

The Hickory series consists of well drained, moderately permeable soils on side slopes along drainageways in the uplands. These soils formed in glacial till. Slope ranges from 10 to 50 percent.

Hickory soils are similar to Camden and Parke soils and commonly are adjacent to Atlas, Ava, Holton, and Parke soils. The somewhat poorly drained Atlas soils, the moderately well drained Ava soils, and the Parke soils are on side slopes and ridges above the Hickory soils. Parke soils formed in loess and glacial drift. The somewhat poorly drained Holton soils are on bottom land below the Hickory soils.

Typical pedon of Hickory loam, 20 to 50 percent slopes, 1,000 feet south and 600 feet east of the northwest corner of sec. 34, T. 7 N., R. 5 E.

A—0 to 2 inches; very dark grayish brown (10YR 3/2) loam; weak fine granular structure; friable; many roots; medium acid; clear smooth boundary.

E—2 to 9 inches; brown (10YR 4/3) loam; moderate thin platy structure parting to weak fine granular; friable; many roots; common medium pebbles; medium acid; clear smooth boundary.

Bt1—9 to 13 inches; yellowish brown (10YR 5/6) clay loam; moderate fine subangular blocky structure; firm; common roots; common distinct dark brown (7.5YR 4/4) clay films on faces of peds; common medium pebbles; strongly acid; clear smooth boundary.

Bt2—13 to 25 inches; yellowish brown (10YR 5/6) clay loam; strong fine subangular blocky structure; firm; common roots; many distinct dark brown (7.5YR 4/4) clay films on faces of peds; few very dark brown (10YR 2/2) iron stains on faces of peds; common medium pebbles; few coarse pebbles; strongly acid; gradual smooth boundary.

Bt3—25 to 33 inches; yellowish brown (10YR 5/6 and 5/8) gravelly clay loam; few fine faint strong brown (7.5YR 5/8) mottles; moderate and strong fine subangular blocky structure; firm; few roots; many distinct dark brown (7.5YR 4/4) clay films on faces of peds; common very dark brown (10YR 2/2) iron stains on faces of peds; strongly acid; clear irregular boundary.

Bt4—33 to 43 inches; yellowish brown (10YR 5/6 and 5/8) gravelly clay loam; few fine faint light brownish gray (10YR 6/2) mottles; weak and moderate medium subangular blocky structure; hard, firm; few roots; few distinct dark brown (7.5YR 4/4) clay films on faces of peds; common very dark brown (10YR 2/2) iron stains on faces of peds; strongly acid; gradual smooth boundary.

BC—43 to 52 inches; brown (10YR 5/3) and yellowish brown (10YR 5/6) gravelly clay loam; few fine faint brownish yellow (10YR 6/8), pale brown (10YR 6/3), and light brownish gray (10YR 6/2) mottles; weak coarse subangular blocky structure in the upper part and massive in the lower part; firm; few distinct dark brown (7.5YR 4/4) clay films on faces of peds; common very dark brown (10YR 2/2) and dark reddish brown (5YR 2/2) iron stains; few cobbles; medium acid; gradual smooth boundary.

C—52 to 60 inches; brown (10YR 5/3) gravelly clay loam; few fine faint light brownish gray (10YR 6/2) and pale brown (10YR 6/3) mottles; massive; hard; common very dark brown (10YR 2/2) and dark reddish brown (5YR 2/2) iron stains; common cobbles; medium acid.

The thickness of the solum ranges from 30 to 65 inches. The loess is less than 16 inches thick. The content of clay in the argillic horizon ranges from 27 to 35 percent.

The Ap or A horizon has value of 3 or 4 and chroma of 2 or 3. It is commonly loam, but it is silt loam in areas mantled by loess and is clay loam in severely eroded areas. The E horizon has value of 4 to 6 and

chroma of 2 to 4. The Bt horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 6. The C horizon is gravelly clay loam or loam.

Holton Series

The Holton series consists of somewhat poorly drained, moderately permeable soils on bottom land. These soils formed in loamy and sandy alluvium. Slope ranges from 0 to 2 percent.

Holton soils are similar to Wirt soils and are commonly adjacent to Camden, Hickory, and Wirt soils. The well drained Camden soils are on terraces above the Holton soils. The well drained Hickory soils are on side slopes in the uplands. The well drained Wirt soils are in landscape positions similar to those of the Holton soils but are closer to the streams.

Typical pedon of Holton silt loam, 10 feet west and 1,400 feet south of the northeast corner of sec. 17, T. 7 N., R. 5 E.

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) silt loam, grayish brown (10YR 5/2) dry; few medium distinct brown (7.5YR 4/4) mottles; moderate medium granular structure; friable; neutral; abrupt smooth boundary.

Bw1—10 to 13 inches; dark grayish brown (10YR 4/2) sandy loam; weak medium granular structure; friable; neutral; clear smooth boundary.

Bw2—13 to 16 inches; brown (10YR 5/3) loamy sand; weak fine granular structure; very friable; neutral; clear smooth boundary.

Bw3—16 to 25 inches; dark grayish brown (10YR 4/2) loam; few fine distinct yellowish brown (10YR 5/6) and few fine faint brown (10YR 4/3) mottles; moderate fine granular structure; friable; neutral; clear smooth boundary.

Bw4—25 to 36 inches; grayish brown (10YR 5/2) silt loam; few fine distinct dark brown (7.5YR 4/4) mottles; moderate medium granular structure; friable; neutral; gradual smooth boundary.

C—36 to 60 inches; dark gray (10YR 4/1) loam; common medium distinct dark brown (7.5YR 4/4) and few fine faint grayish brown (10YR 5/2) mottles; massive; firm; neutral.

The Ap horizon has value of 3 to 5 and chroma of 2 or 3. The Bw horizon has value of 3 to 6. Some pedons have a dark buried soil below a depth of 40 inches. The control section averages less than 18 percent clay.

Hoyleton Series

The Hoyleton series consists of somewhat poorly drained, slowly permeable soils on broad ridges, side slopes, and knolls in the uplands. These soils formed in loess and in the underlying sediments at the surface of the Illinoian till plain. Slope ranges from 0 to 7 percent.

Hoyleton soils are similar to Bluford soils and commonly are adjacent to Cisne, Darmstadt, and Newberry soils. Bluford soils have an Ap horizon with value of 4 or more. The poorly drained Cisne and Newberry soils are lower on the landscape than the Hoyleton soils. Darmstadt soils have a natric horizon. They are in landscape positions similar to those of the Hoyleton soils.

Typical pedon of Hoyleton silt loam, 0 to 2 percent slopes, 550 feet east and 690 feet north of the center of sec. 8, T. 7 N., R. 4 E.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, brown (10YR 5/3) dry; moderate medium granular structure; friable; common roots; neutral; abrupt smooth boundary.

E—9 to 13 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; common roots; few faint dark brown (10YR 3/3) organic coatings on faces of peds; medium acid; clear smooth boundary.

BE—13 to 15 inches; dark yellowish brown (10YR 4/4) silty clay loam; common fine prominent yellowish red (5YR 5/8) mottles; moderate fine subangular blocky structure; firm; common roots; very strongly acid; clear smooth boundary.

Bt1—15 to 23 inches; grayish brown (10YR 5/2) silty clay loam; few medium and coarse prominent yellowish red (5YR 4/6) and common fine distinct strong brown (7.5YR 4/6) mottles; moderate medium subangular blocky structure parting to strong fine subangular blocky; firm; common roots; few distinct grayish brown (10YR 5/2) clay films on vertical and horizontal faces of peds; very strongly acid; gradual smooth boundary.

Bt2—23 to 33 inches; dark brown (10YR 4/3) silty clay loam; common fine and medium distinct strong brown (7.5YR 5/6) mottles; strong coarse subangular blocky structure parting to strong medium subangular blocky; firm; few roots; common prominent very dark brown (10YR 2/2) and grayish brown (10YR 5/2) clay films on vertical and

horizontal faces of peds; very strongly acid; gradual wavy boundary.

Bt3—33 to 45 inches; brown (10YR 5/3) silty clay loam; common fine distinct strong brown (7.5YR 5/6) mottles; moderate coarse subangular blocky structure parting to moderate medium subangular blocky; firm; few roots; few distinct grayish brown (10YR 5/2) clay films on vertical and horizontal faces of peds; strongly acid; gradual irregular boundary.

2BC—45 to 52 inches; dark brown (7.5YR 4/4) loam; weak coarse angular blocky structure; very firm; few roots; ¼- to ½-inch tongues of grayish brown (10YR 5/2) silt loam; medium acid; gradual smooth boundary.

2C—52 to 60 inches; yellowish brown (10YR 5/4) loam; common fine and medium distinct grayish brown (10YR 5/2) mottles; massive; very firm; few fine distinct black (N 2/0) accumulations of iron and manganese oxide; slightly acid.

The thickness of the solum ranges from 36 to 60 inches. The thickness of the loess ranges from 30 to 45 inches. The content of clay in the argillic horizon ranges from 35 to 45 percent.

The Ap horizon has value of 2 or 3 and chroma of 1 to 3. The E horizon has value of 4 to 6 and chroma of 3 or 4. Some pedons in eroded areas do not have an E horizon. The Bt horizon has hue of 10YR or 7.5YR and value of 4 to 6. It has mottles with hue of 5YR, 7.5YR, or 10YR. It is silty clay loam or silty clay. The 2BC and 2C horizons are silt loam, loam, or clay loam.

Huey Series

The Huey series consists of poorly drained, very slowly permeable soils on broad plains in the uplands. These soils formed in loess and in the underlying erosional sediments at the surface of the Illinoian till plain. Slope ranges from 0 to 2 percent.

Huey soils are similar to Darmstadt soils and commonly are adjacent to Cisne, Darmstadt, Hoyleton, and Tamalco soils. Cisne and Hoyleton soils do not have a natric horizon. Cisne soils are in landscape positions similar to those of the Huey soils. The somewhat poorly drained Darmstadt and Hoyleton and moderately well drained Tamalco soils are higher on the landscape than the Huey soils.

Typical pedon of Huey silt loam, 1,040 feet east and 1,290 feet south of the northwest corner of sec. 12, T. 8 N., R. 4 E.

Ap—0 to 8 inches; dark grayish brown (2.5Y 4/2) silt loam, light brownish gray (2.5Y 6/2) dry; moderate fine granular structure; friable; common fine roots; neutral; abrupt smooth boundary.

Eg—8 to 10 inches; grayish brown (2.5Y 5/2) silt loam; weak thin platy structure parting to weak fine granular; friable; common fine roots; medium acid; clear smooth boundary.

Btg1—10 to 15 inches; dark grayish brown (2.5Y 4/2) silty clay loam; few fine prominent yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; few fine roots; few distinct grayish brown (10YR 5/2) clay films on faces of peds; common distinct light gray (10YR 7/2 dry) silt coatings on faces of peds in the upper 3 inches; few fine black (N 2/0) accumulations of iron and manganese oxide; neutral; clear smooth boundary.

Btg2—15 to 18 inches; grayish brown (2.5Y 5/2) silty clay loam; few fine prominent yellowish brown (10YR 5/6) mottles; moderate coarse subangular blocky structure; firm; few fine roots; few distinct grayish brown (10YR 5/2) clay films on faces of peds; few fine black (N 2/0) accumulations of iron and manganese oxide; moderately alkaline; clear smooth boundary.

Btg3—18 to 23 inches; grayish brown (2.5Y 5/2) silty clay; few fine and medium prominent yellowish brown (10YR 5/6) mottles; moderate coarse subangular blocky structure; very firm; few fine roots; common distinct grayish brown (10YR 5/2) clay films on faces of peds; few fine black (N 2/0) accumulations of iron and manganese oxide; few white (N 8/0) accumulations of calcium carbonate; moderately alkaline; gradual smooth boundary.

Btg4—23 to 34 inches; grayish brown (2.5Y 5/2) silty clay loam; few medium and coarse prominent yellowish brown (10YR 5/6) mottles; moderate coarse subangular blocky structure; firm; few fine roots; few distinct grayish brown (10YR 5/2) clay films on faces of peds; few fine black (N 2/0) accumulations of iron and manganese oxide; moderately alkaline; gradual smooth boundary.

Btg5—34 to 49 inches; grayish brown (2.5Y 5/2) silty clay loam; common coarse prominent dark yellowish brown (10YR 4/6) mottles; moderate coarse subangular blocky structure; firm; few fine roots; few distinct grayish brown (10YR 5/2) clay films on faces of peds; few fine and coarse black (N 2/0) accumulations of iron and manganese oxide; moderately alkaline; gradual smooth boundary.

2BCg—49 to 57 inches; light brownish gray (10YR 6/2)

silt loam; common coarse distinct yellowish brown (10YR 5/6) and dark yellowish brown (10YR 4/6) mottles; weak coarse subangular blocky structure; firm; few faint grayish brown (10YR 5/2) clay films on faces of peds and lining crayfish holes and pores; about 20 percent sand; very few fine black (N 2/0) accumulations of iron and manganese oxide; moderately alkaline; gradual smooth boundary.

2Cg—57 to 65 inches; light brownish gray (10YR 6/2) loam; common coarse distinct dark yellowish brown (10YR 4/6) mottles; massive; friable; moderately alkaline.

The thickness of the solum ranges from 36 to more than 60 inches. The thickness of the loess ranges from 24 to 50 inches. Depth to the natric horizon ranges from 10 to 16 inches. The content of clay in the argillic horizon ranges from 27 to 42 percent. It averages less than 35 percent.

The Ap horizon has value of 3 to 5 and chroma of 1 or 2. The Eg horizon has value of 5 to 7. Some pedons do not have an E horizon. The Btg horizon has hue of 10YR or 2.5Y, value of 4 to 7, and chroma of 1 or 2. The 2Cg horizon is loam, silt loam, or clay loam.

Newberry Series

The Newberry series consists of poorly drained, slowly permeable soils on broad plains and in depressions on uplands. These soils formed in loess and in the underlying sediments at the surface of the Illinoian till plain. Slope ranges from 0 to 2 percent.

Newberry soils are similar to Ebbert soils and commonly are adjacent to Cisne, Ebbert, and Huey soils. Cisne soils have more clay in the argillic horizon than the Newberry soils. Also, they are slightly higher on the landscape. Ebbert soils have a mollic epipedon. They are in depressions slightly below the Newberry soils. Huey soils have a natric horizon. They are on plains slightly above the Newberry soils.

Typical pedon of Newberry silt loam, 2,250 feet south and 50 feet west of the northeast corner of sec. 14, T. 8 N., R. 4 E.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine and medium granular structure; friable; common fine roots; neutral; abrupt smooth boundary.

E—8 to 18 inches; dark grayish brown (10YR 4/2) silt loam; many fine distinct dark yellowish brown (10YR 4/6) mottles; moderate medium and coarse granular structure; friable; common fine roots; medium acid; clear smooth boundary.

Bt/E—18 to 23 inches; light brownish gray (10YR 6/2) silty clay loam (Bt); many fine distinct yellowish brown (10YR 5/6) mottles; moderate fine and medium subangular blocky structure; firm; few fine roots; very few distinct dark grayish brown (10YR 4/2) clay films on faces of peds; many distinct light brownish gray (2.5Y 6/2 dry) silt coatings on faces of peds (E); very strongly acid; clear smooth boundary.

Btg1—23 to 34 inches; light brownish gray (10YR 6/2) silty clay loam; common fine distinct yellowish brown (10YR 5/6) mottles; moderate coarse subangular blocky structure; firm; few fine roots; few distinct gray (10YR 5/1) clay films on faces of peds; few fine concretions of iron and manganese oxide; medium acid; gradual smooth boundary.

Btg2—34 to 40 inches; gray (10YR 5/1) silty clay loam; common fine and medium distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; firm; few fine roots; common distinct gray (10YR 5/1) clay films on faces of peds; few very fine pebbles; few fine concretions of iron and manganese oxide; medium acid; gradual smooth boundary.

2Btg3—40 to 60 inches; grayish brown (2.5Y 5/2) silty clay loam; common medium and coarse prominent yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; firm; few distinct gray (10YR 5/1) clay films on faces of peds and in root channels; few fine pebbles; few fine concretions of iron and manganese oxide; neutral.

The thickness of the solum ranges from 40 to more than 60 inches. The thickness of the loess ranges from 30 to 55 inches. The content of clay in the argillic horizon ranges from 27 to 35 percent.

The Ap horizon has value of 2 or 3 and chroma of 1 or 2. The E horizon has value of 4 to 6 and chroma of 1 or 2. The Btg and 2Btg horizons have value of 4 to 6. Some pedons have a 2Cg horizon within a depth of 60 inches. The 2Btg and 2Cg horizons are silty clay loam, clay loam, or loam.

Parke Series

The Parke series consists of well drained, moderately permeable soils on ridges and side slopes in the uplands. These soils formed in loess and glacial drift. Slope ranges from 1 to 10 percent.

Parke soils are similar to Ava, Camden, and Hickory

soils and commonly are adjacent to Ava, Bluford, and Hickory soils. The moderately well drained Ava soils are in landscape positions similar to those of the Parke soils. They have fragic soil properties in the lower part. The somewhat poorly drained Bluford soils are on the less sloping ridges and in broad areas below the Parke soils. Camden soils formed in silty material and in stratified, loamy material. Hickory soils formed in glacial till. They are on the steeper side slopes below the Parke soils.

Typical pedon of Parke silt loam, 1 to 5 percent slopes, 750 feet south and 365 feet east of the northwest corner of sec. 25, T. 8 N., R. 5 E.

Ap—0 to 6 inches; dark brown (10YR 3/3) silt loam, pale brown (10YR 6/3) dry; moderate fine granular structure; friable; common roots; slightly acid; abrupt smooth boundary.

E—6 to 9 inches; dark yellowish brown (10YR 4/4) silt loam; moderate coarse granular structure; friable; common roots; few worm casts; slightly acid; clear smooth boundary.

Bt1—9 to 19 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium subangular blocky structure; firm; few roots; few faint clay films on faces of peds; strongly acid; gradual smooth boundary.

Bt2—19 to 39 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate coarse subangular blocky structure; firm; few roots; common distinct clay films on faces of peds; very strongly acid; gradual smooth boundary.

2Bt3—39 to 46 inches; dark brown (7.5YR 4/4) silt loam; few medium and coarse distinct brown (10YR 5/3) mottles; moderate coarse subangular blocky structure parting to moderate medium subangular blocky; firm; few roots; few faint brown (7.5YR 4/4) clay films on faces of peds, very strongly acid; gradual smooth boundary.

2Bt4—46 to 51 inches; dark brown (7.5YR 4/4) loam; few medium and coarse distinct grayish brown (10YR 5/2) mottles; moderate coarse subangular blocky structure parting to moderate medium subangular blocky; firm; few roots; few pores; few pebbles; very strongly acid; gradual smooth boundary.

2BC—51 to 60 inches; strong brown (7.5YR 5/6) loam; few medium distinct brown (10YR 5/3) mottles; weak medium subangular blocky structure; firm; few pebbles surrounded by thin clay films; few pores; very strongly acid.

The thickness of the solum ranges from 50 to more than 60 inches. The thickness of the loess ranges from 20 to 40 inches. The content of clay in the argillic horizon ranges from 22 to 35 percent.

The Ap horizon has value of 3 to 5 and chroma of 2 to 4. It is silt loam or silty clay loam. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. The 2Bt horizon has hue of 10YR, 7.5YR, or 5YR. It is silty clay loam, silt loam, or loam. The 2BC horizon is loam, sandy clay loam, or sandy loam.

Shiloh Series

The Shiloh series consists of very poorly drained, moderately slowly permeable soils in shallow depressions on uplands. These soils formed in loess. Slope ranges from 0 to 2 percent.

Shiloh soils are commonly adjacent to Cisne, Ebbert, and Newberry soils, which are in the slightly higher areas.

Typical pedon of Shiloh silty clay loam, 1,580 feet north and 50 feet east of the southwest corner of sec. 11, T. 8 N., R. 4 E.

Ap—0 to 7 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; weak medium granular and angular blocky structure; firm; slightly acid; abrupt smooth boundary.

A—7 to 19 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; moderate very fine angular blocky structure; firm; slightly acid; gradual smooth boundary.

Bg1—19 to 35 inches; black (10YR 2/1) silty clay, dark gray (10YR 4/1) dry; strong fine angular blocky structure; very firm; many distinct black (N 2/0) pressure faces on peds; slightly acid; gradual smooth boundary.

Bg2—35 to 48 inches; very dark gray (N 3/0) silty clay, gray (N 5/0) dry; few fine distinct light olive brown (2.5Y 5/6) mottles; strong fine angular blocky structure; very firm; common distinct black (10YR 2/1) pressure faces on peds; slightly acid; clear smooth boundary.

Bg3—48 to 60 inches; dark gray (5Y 4/1) silty clay loam; many coarse distinct very dark gray (N 3/0), common fine distinct light olive brown (2.5Y 5/6), and few fine prominent yellowish brown (10YR 5/8) mottles; weak and moderate medium subangular blocky structure; very firm; slightly acid.

The thickness of the solum ranges from 35 to more

than 60 inches. The thickness of the mollic epipedon ranges from 24 to more than 60 inches. The content of clay in the control section ranges from 35 to 45 percent.

The Ap and A horizons have hue of 10YR or 2.5Y or are neutral in hue. They have chroma of 2 or less. The Bg horizon has hue of 10YR, 2.5Y, or 5Y or is neutral in hue. It has value of 2 to 6 and chroma of 2 or less.

Tamalco Series

The Tamalco series consists of moderately well drained, very slowly permeable soils on ridges and knolls in the uplands. These soils formed in loess and in the underlying sediments at the surface of the Illinoian till plain. They have a natric horizon. Slope ranges from 1 to 2 percent.

Tamalco soils commonly are adjacent to Atlas, Darmstadt, and Hoyleton soils. The adjacent soils do not have a natric horizon. They are in landscape positions similar to those of the Tamalco soils.

Typical pedon of Tamalco silt loam, 1,345 feet south and 360 feet west of the northeast corner of sec. 7, T. 8 N., R. 5 E.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate fine and medium granular structure; friable; many fine and medium roots; mildly alkaline; clear smooth boundary.

E—9 to 12 inches; pale brown (10YR 6/3) silt loam; few fine distinct yellowish brown (10YR 5/6) mottles; moderate medium and coarse granular structure; friable; common fine and medium roots; few medium concretions of iron and manganese oxide; 2.3 percent exchangeable sodium; very strongly acid; clear smooth boundary.

Bt1—12 to 18 inches; brown (10YR 5/3) silty clay; common medium prominent yellowish red (5YR 5/6) mottles; strong fine and medium subangular blocky structure; firm; few distinct dark brown (7.5YR 4/4) clay films on faces of peds; few distinct light gray (10YR 7/2 dry) silt coatings on faces of peds in the upper part; common fine and medium roots; 7.3 percent exchangeable sodium; very strongly acid; clear smooth boundary.

Bt2—18 to 20 inches; brown (7.5YR 4/4) silty clay; strong medium subangular blocky structure; firm; common fine and medium roots; few distinct dark brown (7.5YR 4/4) clay films on faces of peds; 7.3 percent exchangeable sodium; very strongly acid; clear smooth boundary.

Bt3—20 to 25 inches; yellowish brown (10YR 5/4) silty clay; few medium faint yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; firm; few fine roots; few prominent dark brown (10YR 3/3) clay films on faces of peds and in root channels; 13.9 percent exchangeable sodium in the upper part, 20 percent in the lower part; medium acid; gradual smooth boundary.

Bt4—25 to 35 inches; light brownish gray (10YR 6/2) silty clay loam; common fine and medium distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; firm; few fine roots; few faint light brownish gray (10YR 6/2) clay films on faces of peds; few fine concretions of iron and manganese oxide; 26.1 percent exchangeable sodium; moderately alkaline; gradual smooth boundary.

2BC—35 to 53 inches; dark yellowish brown (10YR 4/4) silt loam; few medium distinct light brownish gray (10YR 6/2) mottles; moderate coarse subangular blocky structure; firm; few fine roots; few fine and medium concretions of iron and manganese oxide; few fine pebbles; many prominent very pale brown (10YR 7/3 dry) silt coatings on faces of peds; 27.8 percent exchangeable sodium; moderately alkaline; gradual smooth boundary.

3Ab—53 to 60 inches; light yellowish brown (10YR 6/4) loam; weak medium subangular blocky structure; friable; few distinct dark yellowish brown (10YR 4/4) clay films in old root channels; few fine and medium concretions of iron and manganese oxide; few fine pebbles; 17.2 percent exchangeable sodium; moderately alkaline.

The thickness of the solum ranges from 40 to more than 60 inches. Depth to the natric horizon ranges from 20 to 30 inches. The content of clay in the argillic horizon ranges from 30 to 45 percent.

The Ap horizon has value of 4 or 5 and chroma of 1 to 3. The E horizon has value of 4 to 6 and chroma of 2 to 4. Some pedons do not have an E horizon. The Bt horizon has hue of 10YR, 7.5YR, or 5YR and chroma of 2 to 8.

Wirt Series

The Wirt series consists of well drained soils on bottom land. These soils formed in loamy and sandy alluvium. They are moderately permeable in the upper part and moderately rapidly permeable or rapidly

permeable in the lower part. Slope ranges from 0 to 2 percent.

Wirt soils are similar to Holton soils and commonly are adjacent to Camden, Hickory, and Holton soils. Camden soils are on terraces above the Wirt soils. Hickory soils are on side slopes in the uplands. The somewhat poorly drained Holton soils are in landscape positions similar to those of the Wirt soils, but they are commonly farther from the stream channels.

Typical pedon of Wirt loam, 700 feet north and 315 feet west of the southeast corner of sec. 12, T. 8 N., R. 5 E.

Ap—0 to 8 inches; dark brown (10YR 4/3) loam, pale brown (10YR 6/3) dry; weak very fine granular structure; friable; few fine and medium roots; few dark grayish brown (10YR 4/2) worm casts; neutral; abrupt smooth boundary.

C1—8 to 11 inches; dark brown (10YR 4/3) silt loam; weak fine granular structure; friable; few fine roots; few dark grayish brown (10YR 4/2) worm casts; neutral; clear smooth boundary.

C2—11 to 31 inches; brown (10YR 4/3) fine sandy loam; weak fine granular structure; friable; few fine roots; few dark grayish brown (10YR 4/2) worm casts; thin layer of loamy sand at a depth of 17 to 18 inches; neutral; clear smooth boundary.

C3—31 to 49 inches; brown (10YR 4/3) loam; massive; friable; few fine roots; common very dark grayish brown (10YR 3/2) worm casts; neutral; clear smooth boundary.

C4—49 to 60 inches; brown (10YR 4/3) loamy sand; single grain; very friable; few dark grayish brown (10YR 4/2) worm casts; neutral.

The Ap horizon has value of 3 to 5 and chroma of 2 to 4. It is loam or silt loam. The C horizon has value of 3 to 5 and chroma of 3 or 4. The content of clay in the control section averages less than 18 percent.

Wynoose Series

The Wynoose series consists of poorly drained, very slowly permeable soils on broad flats in the uplands. These soils formed in loess and in the underlying sediments at the surface of the Illinoian till plain. Slope ranges from 0 to 2 percent.

Wynoose soils are similar to Cisne soils and commonly are adjacent to Ava, Bluford, and Newberry soils. The moderately well drained Ava soils are on ridges and side slopes above the Wynoose soils. The somewhat poorly drained Bluford soils are in landscape positions similar to those of the Wynoose soils. Cisne soils have an Ap horizon with value of less than 4. Newberry soils are lower on the landscape than the Wynoose soils.

Typical pedon of Wynoose silt loam, 1,857 feet south and 320 feet east of the northwest corner of sec. 29, T. 9 N., R. 6 E.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; common fine and medium roots; mildly alkaline; abrupt smooth boundary.

Eg1—8 to 12 inches; grayish brown (10YR 5/2) silt loam; common fine distinct yellowish brown (10YR 5/8) mottles; weak coarse and moderate medium granular structure; friable; common fine roots; slightly acid; clear smooth boundary.

Eg2—12 to 20 inches; grayish brown (10YR 5/2) silt loam; few fine faint dark grayish brown (10YR 4/2) and common medium distinct yellowish brown (10YR 5/8) mottles; weak medium platy structure parting to moderate medium granular; friable; common fine roots; few fine black (N 2/0) accumulations of iron and manganese oxide; strongly acid; clear smooth boundary.

Btg1—20 to 28 inches; grayish brown (10YR 5/2) silty clay; common medium prominent strong brown (7.5YR 4/6) mottles; moderate medium subangular blocky structure; firm; common fine roots; common faint grayish brown (10YR 5/2) clay films on faces of peds; few fine black (N 2/0) accumulations of iron and manganese oxide; very strongly acid; clear smooth boundary.

Btg2—28 to 35 inches; light brownish gray (10YR 6/2) silty clay loam; common coarse prominent strong brown (7.5YR 4/6) mottles; moderate medium subangular blocky structure; firm; few fine roots; common distinct dark grayish brown (10YR 4/2) clay films on faces of peds; few fine black (N 2/0) accumulations of iron and manganese oxide; light gray (10YR 7/2 dry) uncoated silt grains on faces of peds; very strongly acid; clear smooth boundary.

2Btg3—35 to 46 inches; grayish brown (10YR 5/2) silt loam; common medium prominent strong brown (7.5YR 5/8) mottles; weak fine subangular blocky structure; firm; few fine roots; common faint dark grayish brown (10YR 4/2) clay films on faces of peds; few coarse and fine black (N 2/0) accumulations of iron and manganese oxide; light gray (10YR 7/2) silt coatings on faces of peds; extremely acid; clear smooth boundary.

2BCg—46 to 57 inches; gray (10YR 5/1) silt loam; common medium prominent strong brown (7.5YR 5/8) mottles; weak fine subangular blocky structure; firm; few fine roots; common medium black (N 2/0) accumulations of iron and manganese oxide; strongly acid; gradual irregular boundary.

3Abg—57 to 64 inches; dark gray (10YR 4/1) loam; few medium distinct yellowish brown (10YR 5/8) mottles; weak fine subangular blocky structure; friable; few fine pebbles; strongly acid.

The thickness of the solum ranges from 40 to more than 60 inches. The thickness of the loess ranges from 30 to 45 inches. The content of clay in the argillic horizon ranges from 35 to 42 percent.

The Ap horizon has value of 4 or 5 and chroma of 2 or 3. The Eg horizon has value of 4 to 6 and chroma of 1 to 3. The Btg horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 to 3. The 2Btg and 2BCg horizons are silty clay loam, silt loam, loam, or clay loam. Some pedons do not have a 3Abg horizon.

Formation of the Soils

Laurie L. King, soil scientist, Soil Conservation Service, and Michael B. Littleton, soil scientist, Effingham County, helped prepare this section.

Soil characteristics at any given point are determined by the physical and mineralogical composition of the parent material; the vegetation and animal life on and in the soil; the climate under which the soil material accumulated and has existed since accumulation; relief, or lay of the land; and the length of time that the processes of forces of soil formation have acted on the soil material *(10)*. These five factors are so closely interrelated that the effect of one factor can be described only if conditions for the other factors are specified.

Climate, vegetation, and animal life are active factors of soil formation. They act on the parent material, slowly changing it into a natural body that has genetically related horizons. The effects of climate, vegetation, and animal life are conditioned by relief. The parent material affects the kind of soil profile that forms and in a few areas determines it almost entirely. Finally, some time is always needed for development of distinct soil horizons.

Parent Material

Parent material is the unconsolidated material in which a soil forms. It largely determines the chemical and mineralogical composition of the soil. The soils in Effingham County formed in glacial till, loess, and alluvium. Some of the material was reworked and redeposited by the subsequent actions of water and wind. Although the different kinds of parent material in the county generally are of common glacial origin, their properties vary greatly, depending on how the material was deposited.

Glacial till is material laid down directly by glaciers with a minimum of water action. The last glaciers covered Effingham County about 200,000 to 250,000 years ago. The glacial till in Effingham County is one of two members of the Glassford Formation. The Vandalia till member is of largest extent. It is loamy material that was transported and deposited by the Illinoian ice sheet. The Hagerstown member of the Glassford Formation was deposited and reworked by glacial meltwater in crevices in the ice sheet. It commonly overlies the Vandalia till. Many of the prominent, oval or oblong ridges in the county have cores consisting of Hagerstown till. Parke soils formed in areas of the Hagerstown till. Hickory soils formed in areas of the Vandalia till *(11)*. The Sangamon paleosol formed in the Vandalia till. Atlas soils formed mainly in the Sangamon paleosol *(23)*.

Throughout most of the county, wind-deposited Roxanna silt overlies the Sangamon paleosol *(6)*. The silt is 1.5 to 2.5 feet thick. Peoria loess is deposited on the surface in most areas of the county. The thickness of the loess ranges from 0 inches on some side slopes to about 50 inches on the stable uplands. Most of the soils formed in Peoria loess and in the underlying Roxanna silt. Ava, Bluford, and Cisne are examples.

In about 5 percent of the survey area, the soils are affected by sodium. Darmstadt, Huey, and Tamalco soils have a high concentration of sodium in the subsoil. The source of the sodium is the feldspars in the loess. As sodium is weathered from the feldspars, it is concentrated by the lateral movement of the ground water above the Illinoian till. This lateral movement is the result of slight variations in the permeability of the Illinoian till *(22)*.

Alluvium is material recently deposited by floodwater along present streams. The texture of the alluvium is determined by the velocity of the water that deposited the material and by the source of the material. The Holton and Wirt soils on flood plains formed in loamy or sandy alluvium.

Stream terraces are remnants of former valley floors. They formed as the streams cut deeper into the adjacent landscape *(15)*. The terraces were subsequently covered with a blanket of loess. Camden soils are an example of soils that formed in loess and in the underlying loamy alluvium on terraces.

Vegetation and Animal Life

Soil formation is affected by the vegetation under which the soils formed. On about 49 percent of the acreage in Effingham County, the soils formed under prairie plants *(4)*. As these plants decomposed, the many fine and fibrous roots added large amounts of organic matter to the soils. Cisne, Ebbert, and Shiloh are examples of soils that formed under prairie plants. Near the major drainageways, the dominant native plants were deciduous hardwoods, such as oaks, hickories, and elms *(13)*. The soils that formed under these plants make up about 51 percent of the county. They have a thin, relatively light colored surface layer. Hickory and Wynoose soils are examples.

Living organisms other than trees and grasses have also affected soil formation. These include the microorganisms, fungi, earthworms, insects, and burrowing animals that live on or in the soil. Earthworms convert raw vegetative material into humus and mix this humus with the mineral part of the soil. This activity has affected the formation of a friable, granular surface layer in many of the soils. Ants and crawfish transport material from the subsoil to the surface. Field mice, moles, and shrews also mix the soil. The tunnels and channels formed by the activities of these animals facilitate the movement of water through the soil *(16)*.

Human activities can affect the formation of soils. Farming can change the amount of organic matter in the surface soil and the amount of runoff and erosion on a particular soil. Building dikes and levees can reduce the frequency of flooding on soils along streams, and installing subsurface drains can lower the water table in the more poorly drained soils.

Climate

Climate significantly affects soil formation through its effects on weathering, vegetation, and erosion. Temperature and precipitation affect the physical and chemical nature of the soils. The weathering of minerals in the soils intensifies as the temperature increases. As water moves through the soil, soluble salts are dissolved and transported downward and laterally with the water. The water also transports clay-size particles from the surface soil to the subsoil. Some of the soils in the county have a claypan as a result of this translocation of clay. Climate also affects soil formation through the interaction of climate and vegetation. The temperature and precipitation in the county favor both prairie and forest vegetation.

Effingham County has a temperate, humid continental climate. The climate has affected the soils throughout the county, but climatic differences within the county are too small to have caused any obvious differences among the soils.

Relief

Relief tends to modify the effects of the other soil-forming factors. It affects the amount of water in the soil through its influence on runoff and on the infiltration of water into the soil. The slopes in Effingham County range from 0 to 50 percent.

Differences in natural drainage generally are closely associated with relief. Soils that formed in the more sloping uplands are well drained and have a brown and yellowish brown subsoil. Hickory soils are an example. Soils that formed in nearly level areas, such as shallow depressions and broad plains, are poorly drained or very poorly drained and have a grayish subsoil. Ebbert and Newberry soils are examples. Soils that formed in intermediate landscape positions, such as on low ridges and gently sloping side slopes, commonly are somewhat poorly drained and have a grayish and brownish, mottled subsoil. Bluford and Hoyleton soils are examples.

Time

Time is necessary for the other soil-forming factors to interact. Soils generally become more strongly developed the more they are exposed to weathering processes. The influence of time, however, can be modified by the deposition of new material and by topography. Soils on bottom land, such as Holton and Wirt soils, receive new deposits each time they are flooded. They are genetically much younger than the other soils in the county. Bluford and Wynoose are examples of mature soils.

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Glossary

ABC soil. A soil having an A, a B, and a C horizon.

AC soil. A soil having only an A and a C horizon. Commonly, such soil formed in recent alluvium or on steep rocky slopes.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Argillic horizon. A subsoil horizon characterized by an accumulation of illuvial clay.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation-exchange capacity.

Bedding system. A drainage system made by plowing, grading, or otherwise shaping the surface of a flat field. It consists of a series of low ridges separated by shallow, parallel dead furrows.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Bottom land. The normal flood plain of a stream, subject to flooding.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-

control measures on a complex slope is difficult.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most

mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil is not a source of gravel or sand for construction purposes.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, and clay.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Forb. Any herbaceous plant not a grass or a sedge.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Glacial drift (geology). Pulverized and other rock material transported by glacial ice and then deposited. Also, the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. The major horizons are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, any plowed or disturbed surface layer.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an O, A, or E horizon. The B horizon is in part a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) granular, prismatic, or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Hard, consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake in inches per hour is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Mollic epipedon. A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Moraine (geology). An accumulation of earth, stones, and other debris deposited by a glacier. Some types are terminal, lateral, medial, and ground.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Natric horizon. A special kind of argillic horizon that contains enough exchangeable sodium to have an adverse effect on the physical condition of the subsoil.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan*.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water

through the soil, adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are—

Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep-sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rippable. Bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 draw bar horsepower rating.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Sequum. A sequence consisting of an illuvial horizon

and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slick spot. A small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil is generally silty or clayey, is slippery when wet, and is low in productivity.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to soil blowing and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Breaking up a compact subsoil by pulling a special chisel through the soil.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from about 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons. It includes all subdivisions of these horizons.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series

because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Till plain. An extensive flat to undulating area underlain by glacial till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

(Recorded in the period 1951-80 at Effingham, Illinois)

Month	Temperature						Precipitation				
				2 years in 10 will have--				2 years in 10 will have--			
	Average daily maximum	Average daily minimum	Average	Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days*	Average	Less than--	More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January-----	36.2	18.3	27.3	65	-11	3	1.95	1.12	2.36	4.5	8.1
February----	41.3	22.2	31.7	68	-6	5	2.19	1.38	3.02	4.6	4.1
March-------	51.7	31.5	41.6	77	9	45	3.57	1.99	4.94	7.1	3.7
April-------	66.0	42.9	54.5	85	24	189	3.77	2.08	4.96	7.9	.2
May---------	76.0	51.9	64.0	92	32	402	3.71	2.24	4.97	7.0	.0
June--------	85.0	61.0	73.0	97	45	672	4.58	2.78	5.74	6.7	.0
July--------	88.5	65.1	76.8	99	50	830	4.19	2.58	5.46	6.1	.0
August------	86.8	62.9	74.9	98	48	762	2.65	1.40	3.93	4.8	.0
September---	80.6	55.1	67.9	96	36	525	3.07	1.30	4.65	4.8	.0
October-----	68.8	43.5	56.2	90	25	229	2.30	1.08	3.24	4.5	.0
November----	53.1	33.2	43.2	78	10	51	3.00	1.58	4.00	5.4	1.4
December----	41.1	24.5	32.8	67	-3	6	2.83	1.01	4.00	5.1	3.4
Yearly:											
Average---	64.6	42.7	53.7	---	---	---	---	---	---	---	---
Total-----	---	---	---	---	---	3,719	37.81	20.54	51.27	68.5	20.9

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 degrees F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

(Recorded in the period 1951-80 at Effingham, Illinois)

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	Apr. 9	Apr. 21	May 9
2 years in 10 later than--	Apr. 2	Apr. 12	May 4
5 years in 10 later than--	Mar. 23	Apr. 8	Apr. 17
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 14	Oct. 5	Oct. 3
2 years in 10 earlier than--	Oct. 30	Oct. 10	Oct. 5
5 years in 10 earlier than--	Nov. 7	Oct. 28	Oct. 17

TABLE 3.--GROWING SEASON

(Recorded in the period 1951-80 at Effingham, Illinois)

Probability	Daily minimum temperature during growing season		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	249	226	193
8 years in 10	235	216	192
5 years in 10	223	196	173
2 years in 10	209	175	155
1 year in 10	199	169	151

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
2	Cisne silt loam	76,200	24.7
3A	Hoyleton silt loam, 0 to 2 percent slopes	23,535	7.6
3B	Hoyleton silt loam, 2 to 7 percent slopes	7,675	2.5
7C2	Atlas silt loam, 4 to 12 percent slopes, eroded	10,245	3.3
7C3	Atlas silty clay loam, 4 to 12 percent slopes, severely eroded	1,935	0.6
8D2	Hickory silt loam, 10 to 15 percent slopes, eroded	8,070	2.6
8E	Hickory loam, 15 to 20 percent slopes	4,495	1.5
8F	Hickory loam, 20 to 50 percent slopes	23,575	7.6
12	Wynoose silt loam	8,930	2.9
13A	Bluford silt loam, 0 to 2 percent slopes	31,210	10.1
13B	Bluford silt loam, 2 to 5 percent slopes	8,550	2.8
14B	Ava silt loam, 1 to 5 percent slopes	28,205	9.1
14C2	Ava silt loam, 5 to 12 percent slopes, eroded	1,545	0.5
15B	Parke silt loam, 1 to 5 percent slopes	380	0.1
15C2	Parke silt loam, 5 to 10 percent slopes, eroded	205	0.1
48	Ebbert silt loam	5,930	1.9
120	Huey silt loam	2,195	0.7
134B	Camden silt loam, 1 to 5 percent slopes	1,230	0.4
134C2	Camden silt loam, 5 to 10 percent slopes, eroded	705	0.2
138	Shiloh silty clay loam	1,090	0.4
218	Newberry silt loam	23,850	7.7
225	Holton silt loam	20,340	6.6
226	Wirt loam	4,910	1.6
581	Tamalco silt loam	1,180	0.4
584B2	Grantfork silty clay loam, 2 to 5 percent slopes, eroded	2,000	0.6
620	Darmstadt silt loam	9,550	3.1
	Water	1,385	0.4
	Total	309,120	100.0

TABLE 5.--PRIME FARMLAND

(Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland. If a soil is prime farmland only under certain conditions, the conditions are specified in parentheses after the soil name)

Map symbol	Soil name
2	Cisne silt loam (where drained)
3A	Hoyleton silt loam, 0 to 2 percent slopes
3B	Hoyleton silt loam, 2 to 7 percent slopes
13A	Bluford silt loam, 0 to 2 percent slopes (where drained)
13B	Bluford silt loam, 2 to 5 percent slopes (where drained)
14B	Ava silt loam, 1 to 5 percent slopes
15B	Parke silt loam, 1 to 5 percent slopes
48	Ebbert silt loam (where drained)
134B	Camden silt loam, 1 to 5 percent slopes
138	Shiloh silty clay loam (where drained)
218	Newberry silt loam (where drained)
225	Holton silt loam (where drained and either protected from flooding or not frequently flooded during the growing season)
226	Wirt loam (where protected from flooding or not frequently flooded during the growing season)

TABLE 6.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE

(Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Soil name and map symbol	Land capability	Corn	Soybeans	Winter wheat	Orchardgrass-alfalfa hay	Tall fescue-alfalfa
		Bu	Bu	Bu	Tons	AUM*
2------------------------ Cisne	IIIw	115	35	52	---	---
3A----------------------- Hoyleton	IIw	116	34	53	4.7	7.5
3B----------------------- Hoyleton	IIe	115	34	52	4.7	7.4
7C2---------------------- Atlas	IIIe	52	16	19	2.2	3.6
7C3---------------------- Atlas	IVe	43	13	16	1.8	3.0
8D2---------------------- Hickory	IIIe	72	23	26	2.7	4.5
8E----------------------- Hickory	IVe	70	23	25	2.6	---
8F----------------------- Hickory	VIIe	---	---	---	---	---
12----------------------- Wynoose	IIIw	96	33	46	---	---
13A---------------------- Bluford	IIw	103	33	49	4.1	6.8
13B---------------------- Bluford	IIe	102	33	49	4.1	6.7
14B---------------------- Ava	IIe	97	33	48	4.3	7.1
14C2--------------------- Ava	IIIe	89	30	44	3.9	6.5
15B---------------------- Parke	IIe	110	31	52	4.4	7.4
15C2--------------------- Parke	IIIe	105	30	50	4.2	7.1
48----------------------- Ebbert	IIw	130	42	54	---	---
120---------------------- Huey	IVw	64	23	33	---	---
134B--------------------- Camden	IIe	124	39	54	5.0	8.2
134C2-------------------- Camden	IIIe	117	37	52	4.7	7.8

See footnote at end of table.

TABLE 6.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn	Soybeans	Winter wheat	Orchardgrass-alfalfa hay	Tall fescue-alfalfa
		Bu	Bu	Bu	Tons	AUM*
138: Shiloh	IIw	139	46	56	---	8.3
218: Newberry	IIw	118	37	---	---	---
225: Holton	IIIw	75	26	---	3.0	6.3
226: Wirt	IIw	95	32	---	4.0	7.3
581: Tamalco	IIIs	70	24	34	2.9	4.8
584B2: Grantfork	IIIe	47	21	28	2.3	3.8
620: Darmstadt	IIIw	69	26	36	3.0	5.0

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY

(Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available)

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Volume*	Trees to plant
7C2, 7C3: Atlas	4C	Slight	Slight	Moderate	Moderate	White oak	70	52	Green ash, pin oak, red maple, Austrian pine.
						Northern red oak	70	52	
						Bur oak	70	52	
						Green ash	---	---	
8D2: Hickory	5A	Slight	Slight	Slight	Slight	White oak	85	67	Eastern white pine, red pine, yellow poplar, sugar maple, white oak, black walnut.
						Northern red oak	85	67	
						Black oak	---	---	
						Green ash	---	---	
						Bitternut hickory	---	---	
						Yellow poplar	95	98	
8E: Hickory	5R	Moderate	Moderate	Slight	Slight	White oak	85	67	Eastern white pine, red pine, yellow poplar, sugar maple, white oak, black walnut.
						Northern red oak	85	67	
						Black oak	---	---	
						Green ash	---	---	
						Bitternut hickory	---	---	
						Yellow poplar	95	98	
8F: Hickory	5R	Severe	Severe	Slight	Slight	White oak	85	67	Eastern white pine, red pine, yellow poplar, sugar maple, white oak, black walnut.
						Northern red oak	85	67	
						Black oak	---	---	
						Green ash	---	---	
						Bitternut hickory	---	---	
						Yellow poplar	95	98	
12: Wynoose	4W	Slight	Severe	Moderate	Moderate	Pin oak	70	52	Pin oak, red maple.
						White oak	---	---	
						Black oak	---	---	
13A, 13B: Bluford	4A	Slight	Slight	Slight	Slight	White oak	70	52	Shortleaf pine, loblolly pine, eastern white pine, eastern redcedar.
						Northern red oak	70	52	
						Southern red oak	70	52	
						Green ash	---	---	
						Bur oak	---	---	
14B, 14C2: Ava	4A	Slight	Slight	Slight	Slight	White oak	75	57	Black walnut, eastern cottonwood, sweetgum, yellow poplar, white oak, American sycamore.
						Northern red oak	80	62	
						Yellow poplar	90	90	
						Black walnut	---	---	

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordi-nation symbol	Management concerns: Erosion hazard	Management concerns: Equip-ment limita-tion	Management concerns: Seedling mortal-ity	Management concerns: Wind-throw hazard	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Volume*	Trees to plant
15B, 15C2------- Parke	5A	Slight	Slight	Slight	Slight	White oak----------- Yellow poplar------- Sweetgum------------	90 98 76	72 104 70	Eastern white pine, red pine, black walnut, yellow poplar, white ash, black locust, northern red oak, green ash, black cherry, American sycamore, eastern cottonwood.
134C2----------- Camden	7A	Slight	Slight	Slight	Slight	Yellow poplar------- White oak----------- Northern red oak---- Sweetgum------------ Green ash-----------	95 85 85 80 76	98 67 67 79 75	White oak, black walnut, green ash, eastern white pine, red pine, yellow poplar, black locust, white ash.
225------------- Holton	5A	Slight	Slight	Slight	Slight	Pin oak------------- Northern red oak---- Yellow poplar------- Sugar maple--------- White oak----------- Black walnut-------- Black cherry-------- White ash-----------	85 80 90 80 --- --- --- ---	67 62 90 50 --- --- --- ---	Eastern white pine, yellow poplar, black walnut, red pine, white ash, white oak.
226------------- Wirt	4A	Slight	Slight	Slight	Slight	Northern red oak---- Yellow poplar------- Sugar maple--------- Green ash----------- Black walnut-------- Boxelder------------	82 90 --- --- --- ---	64 90 --- --- --- ---	Black walnut, yellow poplar, eastern white pine.

* Volume is the yield in cubic feet per acre per year calculated at the age of culmination of mean annual increment for fully stocked natural stands.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

(The symbol < means less than; > means more than. Absence of an entry indicates that trees generally do not grow to the given height on that soil)

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--			
	8-15	16-25	26-35	>35
2. Cisne	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Norway spruce, Austrian pine, northern white-cedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
3A, 3B. Hoyleton	Eastern redcedar, Washington hawthorn, Amur privet, arrowwood, Amur honeysuckle, American cranberrybush.	Austrian pine, green ash, Osageorange.	Eastern white pine, pin oak.	---
7C2, 7C3. Atlas	American cranberrybush, Amur honeysuckle, arrowwood, Amur privet, Washington hawthorn, eastern redcedar.	Osageorange, green ash, Austrian pine.	Pin oak, eastern white pine.	---
8D2, 8E, 8F. Hickory	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
12. Wynoose	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, white fir, blue spruce, northern white-cedar, Austrian pine, Norway spruce.	Eastern white pine	Pin oak.
13A, 13B. Bluford	Eastern redcedar, Washington hawthorn, Amur privet, arrowwood, Amur honeysuckle, American cranberrybush.	Austrian pine, green ash, Osageorange.	Eastern white pine, pin oak.	---
14B, 14C2. Ava	Washington hawthorn, Amur privet, eastern redcedar, American arrowwood, Amur honeysuckle, American cranberrybush.	Austrian pine, green ash, Osageorange.	Eastern white pine, pin oak.	---
15B, 15C2. Parke	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, northern white-cedar, blue spruce, white fir.	Austrian pine, Norway spruce.	Pin oak, eastern white pine.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- 8-15	16-25	26-35	>35
48. Ebbert	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	Norway spruce, Austrian pine, northern white-cedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
120. Huey	Eastern redcedar, Russian olive.	Siberian elm, green ash.	---	---
134B, 134C2. Camden	Amur honeysuckle, Amur privet, silky dogwood, American cranberrybush.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
138. Shiloh	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Norway spruce, Austrian pine, northern white-cedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
218. Newberry	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, white fir, blue spruce, northern white-cedar, Austrian pine, Norway spruce.	Eastern white pine	Pin oak.
225. Holton	Amur honeysuckle, Amur privet, American cranberrybush, silky dogwood.	White fir, blue spruce, northern white-cedar, Austrian pine, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
226. Wirt	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	Austrian pine, northern white-cedar, white fir, Washington hawthorn, blue spruce.	Norway spruce	Eastern white pine, pin oak.
581. Tamalco	Russian olive, eastern redcedar.	Siberian elm, green ash.	---	---
584B2. Grantfork	Eastern redcedar, Russian olive.	Green ash, Siberian elm.	---	---
620. Darmstadt	Eastern redcedar, Russian olive.	Siberian elm, green ash.	---	---

TABLE 9.--RECREATIONAL DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe")

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
2--------------------- Cisne	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
3A, 3B---------------- Hoyleton	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
7C2, 7C3-------------- Atlas	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: slope, wetness, percs slowly.	Severe: erodes easily.	Moderate: wetness, slope.
8D2------------------- Hickory	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
8E-------------------- Hickory	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
8F-------------------- Hickory	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
12-------------------- Wynoose	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
13A, 13B-------------- Bluford	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
14B------------------- Ava	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Slight----------	Moderate: wetness.
14C2------------------ Ava	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Moderate: wetness, slope.
15B------------------- Parke	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
15C2------------------ Parke	Slight----------	Slight----------	Severe: slope.	Slight----------	Slight.
48-------------------- Ebbert	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
120------------------- Huey	Severe: wetness, percs slowly, excess sodium.	Severe: wetness, excess sodium, percs slowly.	Severe: wetness, percs slowly, excess sodium.	Severe: wetness.	Severe: excess sodium, wetness.
134B------------------ Camden	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
134C2----------------- Camden	Slight----------	Slight----------	Severe: slope.	Slight----------	Slight.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
138-------------------- Shiloh	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
218-------------------- Newberry	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
225-------------------- Holton	Severe: flooding, wetness.	Moderate: flooding, wetness.	Severe: wetness, flooding.	Moderate: wetness, flooding.	Severe: flooding.
226-------------------- Wirt	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
581-------------------- Tamalco	Severe: percs slowly, excess sodium.	Severe: excess sodium, percs slowly.	Severe: percs slowly, excess sodium.	Slight----------	Severe: excess sodium.
584B2------------------ Grantfork	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
620-------------------- Darmstadt	Severe: wetness, percs slowly, excess sodium.	Severe: excess sodium, percs slowly.	Severe: wetness, percs slowly.	Severe: erodes easily.	Severe: excess sodium.

TABLE 10.--WILDLIFE HABITAT

(See text for definitions of "good," "fair," "poor," and "very poor")

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
2------------------ Cisne	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
3A----------------- Hoyleton	Fair	Good	Good	Good	Fair	Fair	Good	Good	Fair.
3B----------------- Hoyleton	Fair	Good	Good	Good	Fair	Poor	Good	Good	Poor.
7C2, 7C3----------- Atlas	Fair	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
8D2---------------- Hickory	Fair	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
8E----------------- Hickory	Poor	Fair	Good	Good	Very poor	Very poor	Fair	Good	Very poor.
8F----------------- Hickory	Very poor	Poor	Good	Good	Very poor	Very poor	Poor	Good	Very poor.
12----------------- Wynoose	Poor	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
13A---------------- Bluford	Fair	Good	Good	Good	Fair	Fair	Good	Good	Fair.
13B---------------- Bluford	Fair	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
14B, 14C2---------- Ava	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
15B---------------- Parke	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
15C2--------------- Parke	Fair	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
48----------------- Ebbert	Poor	Fair	Fair	Poor	Good	Good	Fair	Poor	Good.
120---------------- Huey	Poor	Poor	Poor	Fair	Good	Good	Poor	Fair	Good.
134B--------------- Camden	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
134C2-------------- Camden	Fair	Good	Good	Good	Poor	Very poor	Good	Good	Poor.
138---------------- Shiloh	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
218---------------- Newberry	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.

TABLE 10.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements						Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba-ceous plants	Hardwood trees	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
225---------------- Holton	Poor	Fair	Fair	Good	Fair	Fair	Fair	Good	Fair.
226---------------- Wirt	Poor	Fair	Fair	Good	Poor	Very poor	Fair	Good	Very poor.
581---------------- Tamalco	Good	Good	Fair	Good	Poor	Fair	Good	Good	Poor.
584B2-------------- Grantfork	Fair	Good	Fair	Good	Poor	Very poor	Fair	Good	Very poor.
620---------------- Darmstadt	Fair	Good	Poor	Good	Fair	Fair	Fair	Good	Fair.

TABLE 11.--BUILDING SITE DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
2 Cisne	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness.
3A, 3B Hoyleton	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, frost action, shrink-swell.	Moderate: wetness.
7C2, 7C3 Atlas	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: wetness, slope.
8D2 Hickory	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
8E, 8F Hickory	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
12 Wynoose	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness.
13A, 13B Bluford	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
14B Ava	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.	Moderate: wetness.
14C2 Ava	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: wetness.	Severe: slope.	Severe: low strength, frost action.	Moderate: wetness, slope.
15B Parke	Slight	Moderate: shrink-swell.	Slight	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
15C2 Parke	Slight	Moderate: shrink-swell.	Slight	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
48 Ebbert	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
120--------------- Huey	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, wetness, frost action.	Severe: excess sodium, wetness.
134B-------------- Camden	Slight---------	Moderate: shrink-swell.	Slight---------	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
134C2------------- Camden	Slight---------	Moderate: shrink-swell.	Slight---------	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
138--------------- Shiloh	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.	Severe: ponding.
218--------------- Newberry	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, wetness, frost action.	Severe: wetness.
225--------------- Holton	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action.	Severe: flooding.
226--------------- Wirt	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
581--------------- Tamalco	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Severe: excess sodium.
584B2------------- Grantfork	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
620--------------- Darmstadt	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Severe: excess sodium.

TABLE 12.--SANITARY FACILITIES

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "good," and other terms. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Area sanitary landfill	Daily cover for landfill
2: Cisne	Severe: wetness, percs slowly.	Slight	Severe: wetness.	Poor: wetness.
3A: Hoyleton	Severe: wetness, percs slowly.	Slight	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
3B: Hoyleton	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
7C2, 7C3: Atlas	Severe: wetness, percs slowly.	Severe: slope.	Moderate: wetness, slope.	Poor: too clayey, hard to pack.
8D2: Hickory	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope.	Fair: too clayey, slope.
8E, 8F: Hickory	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
12: Wynoose	Severe: wetness, percs slowly.	Slight	Severe: wetness.	Poor: wetness.
13A: Bluford	Severe: wetness, percs slowly.	Slight	Severe: wetness.	Poor: wetness.
13B: Bluford	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness.	Poor: wetness.
14B: Ava	Severe: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Fair: too clayey, wetness.
14C2: Ava	Severe: wetness, percs slowly.	Severe: slope, wetness.	Moderate: wetness, slope.	Fair: too clayey, slope, wetness.
15B: Parke	Slight	Moderate: seepage, slope.	Slight	Good.
15C2: Parke	Slight	Severe: slope.	Slight	Good.
48: Ebbert	Severe: ponding, percs slowly.	Slight	Severe: ponding.	Poor: hard to pack, ponding.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Area sanitary landfill	Daily cover for landfill
120----------------- Huey	Severe: wetness, percs slowly.	Slight----------------	Severe: wetness.	Poor: too clayey, ponding, excess sodium.
134B---------------- Camden	Slight---------------	Moderate: seepage, slope.	Slight----------------	Fair: too clayey.
134C2--------------- Camden	Slight---------------	Severe: slope.	Slight----------------	Fair: too clayey.
138----------------- Shiloh	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
218----------------- Newberry	Severe: wetness, percs slowly.	Slight----------------	Severe: wetness.	Poor: hard to pack, wetness.
225----------------- Holton	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: large stones, wetness.
226----------------- Wirt	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding.	Fair: thin layer.
581----------------- Tamalco	Severe: wetness, percs slowly.	Slight----------------	Severe: wetness.	Poor: excess sodium.
584B2--------------- Grantfork	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness.	Poor: wetness.
620----------------- Darmstadt	Severe: wetness, percs slowly.	Slight----------------	Severe: wetness.	Poor: wetness, excess sodium.

TABLE 13.--CONSTRUCTION MATERIALS

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and other terms. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
2 Cisne	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
3A, 3B Hoyleton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
7C2, 7C3 Atlas	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
8D2 Hickory	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
8E Hickory	Fair: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
8F Hickory	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
12 Wynoose	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
13A, 13B Bluford	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
14B Ava	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
14C2 Ava	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
15B, 15C2 Parke	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
48 Ebbert	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
120 Huey	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness, excess sodium.
134B, 134C2 Camden	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
138 Shiloh	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
218 Newberry	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
225 Holton	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, area reclaim.
226 Wirt	Good	Probable	Improbable: too sandy.	Fair: small stones, area reclaim.
581 Tamalco	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, excess sodium.
584B2 Grantfork	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
620 Darmstadt	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess sodium.

TABLE 14.--WATER MANAGEMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Limitations for-- Pond reservoir areas	Limitations for-- Embankments, dikes, and levees	Features affecting-- Drainage	Features affecting-- Terraces and diversions	Features affecting-- Grassed waterways
2: Cisne	Slight	Severe: wetness.	Percs slowly, frost action.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
3A: Hoyleton	Slight	Severe: wetness.	Percs slowly, frost action.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
3B: Hoyleton	Moderate: slope.	Severe: wetness.	Percs slowly, frost action, slope.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
7C2, 7C3: Atlas	Severe: slope.	Severe: hard to pack.	Percs slowly, frost action, slope.	Slope, erodes easily, wetness.	Wetness, slope, erodes easily.
8D2, 8E, 8F: Hickory	Severe: slope.	Moderate: thin layer.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
12: Wynoose	Slight	Severe: wetness.	Percs slowly, frost action.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
13A: Bluford	Slight	Severe: piping.	Percs slowly, frost action.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
13B: Bluford	Moderate: slope.	Severe: piping.	Percs slowly, frost action, slope.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
14B: Ava	Moderate: seepage, slope.	Severe: piping.	Percs slowly, frost action, slope.	Erodes easily, wetness.	Erodes easily, rooting depth.
14C2: Ava	Severe: slope.	Severe: piping.	Percs slowly, frost action, slope.	Slope, erodes easily, wetness.	Slope, erodes easily, rooting depth.
15B: Parke	Moderate: seepage, slope.	Slight	Deep to water	Erodes easily	Erodes easily.
15C2: Parke	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Erodes easily	Erodes easily.
48: Ebbert	Slight	Severe: ponding.	Ponding, percs slowly, frost action.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
120: Huey	Slight	Severe: wetness, excess sodium.	Wetness, percs slowly, frost action.	Erodes easily, wetness, percs slowly.	Wetness, excess sodium, erodes easily.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Limitations for-- Embankments, dikes, and levees	Features affecting-- Drainage	Features affecting-- Terraces and diversions	Features affecting-- Grassed waterways
134B, 134C2------- Camden	Moderate: seepage, slope.	Severe: piping.	Deep to water	Erodes easily	Erodes easily.
138--------------- Shiloh	Slight---------	Severe: ponding.	Ponding, frost action.	Ponding--------	Wetness.
218--------------- Newberry	Slight---------	Severe: wetness.	Percs slowly, frost action.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
225--------------- Holton	Moderate: seepage.	Severe: piping, wetness.	Flooding, large stones, frost action.	Large stones, erodes easily, wetness.	Large stones, wetness, erodes easily.
226--------------- Wirt	Severe: seepage.	Severe: piping.	Deep to water	Erodes easily	Erodes easily.
581--------------- Tamalco	Slight---------	Severe: excess sodium.	Percs slowly, frost action.	Erodes easily, wetness, percs slowly.	Excess sodium, erodes easily.
584B2------------- Grantfork	Moderate: slope.	Moderate: piping, wetness.	Percs slowly, frost action, slope.	Erodes easily, wetness.	Wetness, erodes easily.
620--------------- Darmstadt	Slight---------	Severe: excess sodium.	Percs slowly, frost action.	Erodes easily, wetness.	Wetness, excess sodium.

TABLE 15.--ENGINEERING INDEX PROPERTIES

(The symbol < means less than; > means more than)

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag-ments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct					Pct	
2----------------- Cisne	0-8	Silt loam--------	CL, CL-ML, ML	A-4	0	100	100	90-100	90-100	25-35	5-10
	8-16	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	95-100	90-100	25-35	5-15
	16-45	Silty clay loam, silty clay.	CH, CL	A-7	0	100	100	90-100	90-100	45-60	20-35
	45-60	Silty clay loam, clay loam, silt loam.	CL	A-6, A-7	0-5	100	90-100	70-95	50-90	30-50	15-30
3A, 3B----------- Hoyleton	0-13	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	95-100	85-100	25-35	5-15
	13-45	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	95-100	85-100	40-55	20-30
	45-60	Silt loam, loam, clay loam.	CL, CL-ML	A-6, A-7, A-4	0	100	95-100	90-100	70-95	20-45	5-25
7C2-------------- Atlas	0-6	Silt loam--------	CL, CL-ML	A-6, A-4	0	100	100	95-100	75-95	25-35	5-15
	6-47	Silty clay loam, clay, clay loam.	CH	A-7	0	100	95-100	95-100	75-95	50-70	30-45
	47-60	Loam, clay loam	CH	A-7	0	100	95-100	95-100	75-95	50-70	30-45
7C3-------------- Atlas	0-7	Silty clay loam	CH, CL	A-7	0	100	100	95-100	75-100	40-60	25-40
	7-38	Silty clay loam, clay loam.	CH	A-7	0	100	95-100	95-100	75-95	50-70	30-45
	38-60	Silty clay loam, clay loam.	CH	A-7	0	100	95-100	95-100	75-95	50-70	30-45
8D2-------------- Hickory	0-9	Silt loam--------	CL	A-6, A-4	0-5	95-100	90-100	90-100	75-95	20-35	8-15
	9-52	Clay loam, silty clay loam, gravelly clay loam.	CL	A-6, A-7	0-5	95-100	75-100	70-95	65-80	30-50	15-30
	52-60	Sandy loam, loam, gravelly clay loam.	CL-ML, CL	A-4, A-6	0-5	85-100	75-95	70-95	60-80	20-40	5-20
8E, 8F----------- Hickory	0-9	Loam-------------	CL	A-6, A-4	0-5	95-100	90-100	90-100	75-95	20-35	8-15
	9-52	Clay loam, silty clay loam, gravelly clay loam.	CL	A-6, A-7	0-5	95-100	75-100	70-95	65-80	30-50	15-30
	52-60	Loam, gravelly clay loam.	CL-ML, CL	A-4, A-6	0-5	85-100	75-95	70-95	60-80	20-40	5-20
12--------------- Wynoose	0-8	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	95-100	85-95	20-35	5-15
	8-20	Silt loam--------	CL, ML, CL-ML	A-4, A-6	0	100	100	95-100	85-95	15-30	2-15
	20-35	Silty clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	85-95	40-55	20-35
	35-57	Silt loam, clay loam, silty clay loam.	CL	A-6, A-7	0	100	95-100	90-100	70-90	30-45	15-25
	57-64	Loam, clay loam, silty clay loam.	CL	A-6, A-7	0-10	95-100	90-100	85-100	70-90	25-45	15-30

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
13A, 13B--------- Bluford	0-9	Silt loam--------	CL, CL-ML	A-6, A-4	0	100	95-100	95-100	90-100	20-35	5-15
	9-12	Silt loam--------	ML, CL-ML, CL	A-4	0	100	95-100	95-100	90-100	20-30	NP-10
	12-43	Silty clay loam, silty clay.	CL	A-7, A-6	0	100	95-100	95-100	90-100	35-50	15-30
	43-60	Silt loam, loam, silty clay loam.	CL-ML, CL	A-6, A-4	0-5	100	95-100	90-100	70-90	25-40	5-20
14B-------------- Ava	0-15	Silt loam--------	CL, ML, CL-ML	A-6, A-4	0	100	100	95-100	90-100	25-35	5-15
	15-24	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	90-100	25-45	10-20
	24-48	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	90-100	25-45	10-20
	48-60	Silty clay loam, silt loam, clay loam.	CL, CL-ML, ML	A-4, A-6, A-7	0	100	95-100	90-100	80-90	20-45	5-20
14C2------------- Ava	0-10	Silt loam--------	CL, ML, CL-ML	A-6, A-4	0	100	100	95-100	90-100	25-35	5-15
	10-15	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	90-100	25-45	10-20
	15-38	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	90-100	25-45	10-20
	38-54	Silty clay loam, loam, clay loam.	CL, CL-ML, ML	A-4, A-6, A-7	0	100	95-100	90-100	80-90	20-45	5-20
	54-60	Loam, silt loam, clay loam.	CL, ML, CL-ML	A-4, A-6	0	100	95-100	90-100	80-90	25-40	5-20
15B, 15C2-------- Parke	0-9	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	90-100	70-100	20-35	7-15
	9-46	Silty clay loam, silt loam.	CL, ML	A-6, A-4	0	95-100	95-100	90-100	80-100	25-40	7-15
	46-60	Sandy clay loam, loam, sandy loam.	SC, CL, ML, SM	A-2, A-6, A-4	0-3	90-100	85-95	55-90	30-60	25-35	7-15
48--------------- Ebbert	0-13	Silt loam--------	CL	A-6	0	100	100	95-100	85-100	30-40	10-15
	13-22	Silt loam--------	CL	A-4, A-6	0	100	100	95-100	85-100	25-35	7-15
	22-48	Silty clay loam, silt loam.	CL, CH	A-7	0	100	100	95-100	85-100	40-55	25-35
	48-60	Silty clay loam, clay loam, loam.	CL	A-7, A-6	0	100	95-100	95-100	80-100	30-50	10-30
120-------------- Huey	0-8	Silt loam--------	CL, CL-ML, ML	A-4, A-6	0	100	100	90-100	85-95	20-35	3-15
	8-10	Silt loam--------	CL, ML, CL-ML	A-6, A-4	0	100	100	90-100	85-95	15-30	3-15
	10-15	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	90-100	25-45	10-25
	15-49	Silt loam, silty clay loam, silty clay.	CL	A-6, A-7	0	100	100	95-100	90-100	30-50	15-30
	49-65	Loam, silt loam, clay loam.	CL	A-6	0	95-100	90-100	80-95	65-90	20-35	10-20

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
134B, 134C2------ Camden	0-11	Silt loam--------	CL, ML, CL-ML	A-4, A-6	0	100	100	95-100	90-100	20-35	3-15
	11-24	Silt loam, silty clay loam.	CL	A-6	0	100	100	95-100	90-100	25-40	15-25
	24-49	Clay loam, fine sandy loam, silt loam.	ML, SC, SM, CL	A-2, A-4, A-6	0-5	90-100	85-100	60-100	30-70	20-40	3-15
	49-60	Stratified sandy loam to silt loam.	SM, SC, ML, CL	A-2, A-4	0-5	90-100	80-100	50-80	20-60	<25	3-10
138-------------- Shiloh	0-19	Silty clay loam	CL	A-7	0	100	100	95-100	90-100	40-50	15-25
	19-48	Silty clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	90-100	40-65	15-40
	48-60	Silty clay loam, silty clay, silt loam.	CL	A-7, A-6	0	100	100	95-100	90-100	30-50	15-30
218-------------- Newberry	0-8	Silt loam--------	CL, ML	A-6	0	100	100	95-100	85-100	30-40	10-20
	8-18	Silt loam--------	CL	A-4, A-6	0	100	100	95-100	85-100	30-40	8-15
	18-40	Silty clay loam	CL, CH	A-7, A-6	0	100	100	95-100	85-100	35-55	15-30
	40-60	Silty clay loam, clay loam, loam.	CL	A-7, A-6	0-5	95-100	90-100	75-100	50-90	30-45	15-25
225-------------- Holton	0-10	Silt loam--------	CL, CL-ML, ML	A-4	0-20	90-100	85-100	80-100	60-90	<25	2-10
	10-36	Sandy loam, loam, loamy sand, silt loam.	CL-ML, CL, SM-SC, SC	A-4, A-2, A-6	0-20	90-100	85-100	60-95	30-75	<25	4-12
	36-60	Loam-------------	SC, SM-SC, CL, CL-ML	A-4, A-2, A-6	0-40	75-100	60-100	55-90	30-55	<25	2-14
226-------------- Wirt	0-8	Loam-------------	CL-ML, ML	A-4	0	95-100	90-100	80-100	65-90	<25	3-7
	8-49	Loam, silt loam, fine sandy loam.	CL-ML, ML	A-4	0	95-100	90-100	75-100	55-90	<25	3-7
	49-60	Loamy sand-------	SP, SP-SM, SM	A-1, A-3, A-2-4, A-4	0-5	85-100	50-100	25-95	2-50	<25	NP-4
581-------------- Tamalco	0-9	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	95-100	90-100	25-40	5-15
	9-12	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	95-100	90-100	20-35	5-15
	12-25	Silty clay loam, silty clay.	CH	A-7	0	100	100	95-100	95-100	55-75	35-45
	25-53	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	95-100	30-50	15-25
	53-60	Silt loam, loam, clay loam.	CL	A-6	0	100	100	95-100	80-100	30-40	15-25
584B2------------ Grantfork	0-7	Silty clay loam	CL	A-6	0	100	95-100	85-95	80-90	25-40	10-20
	7-30	Silty clay loam, clay loam, loam.	CL	A-6, A-7	0	100	90-100	80-90	70-80	30-45	10-20
	30-60	Clay loam, loam	CL	A-6, A-7	0-5	95-100	85-95	70-80	55-75	25-45	10-25
620-------------- Darmstadt	0-15	Silt loam--------	CL, ML, CL-ML	A-6, A-7, A-4	0	95-100	95-100	95-100	75-100	25-45	5-20
	15-27	Silty clay loam	CL, CH	A-7	0	100	95-100	95-100	90-100	40-65	20-40
	27-36	Silty clay loam	CL, CH	A-7	0	100	95-100	95-100	90-100	40-65	20-40
	36-60	Silt loam, silty clay loam.	CL	A-6, A-7, A-4	0	95-100	95-100	90-100	75-100	20-50	7-30

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

(The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer)

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
2---------------- Cisne	0-8	15-27	1.30-1.50	0.06-2.0	0.22-0.24	4.5-7.8	Low-----------	0.37	3	6	1-3
	8-16	15-27	1.25-1.45	0.06-0.2	0.18-0.20	4.5-6.0	Low-----------	0.37			
	16-45	35-45	1.40-1.60	<0.06	0.09-0.15	4.5-6.0	High----------	0.37			
	45-60	25-37	1.50-1.70	<0.06	0.08-0.14	5.1-6.5	Moderate------	0.37			
3A, 3B----------- Hoyleton	0-13	20-27	1.30-1.50	0.6-2.0	0.22-0.24	4.5-7.3	Moderate------	0.32	3	6	1-3
	13-45	35-45	1.40-1.65	0.06-0.2	0.13-0.20	4.5-5.5	High----------	0.43			
	45-60	15-33	1.35-1.70	0.06-0.2	0.17-0.22	5.1-7.3	Moderate------	0.43			
7C2-------------- Atlas	0-6	20-27	1.30-1.50	0.2-0.6	0.20-0.24	4.5-7.3	Moderate------	0.43	3	6	.5-1
	6-47	35-45	1.50-1.70	<0.06	0.09-0.13	4.5-7.3	High----------	0.32			
	47-60	25-30	1.50-1.70	<0.06	0.09-0.13	4.5-7.8	High----------	0.32			
7C3-------------- Atlas	0-7	30-40	1.40-1.60	0.06-0.2	4.5-7.3	4.5-7.3	High----------	0.43	2	7	.5-1
	7-38	30-40	1.50-1.70	<0.06	0.09-0.13	4.5-7.3	High----------	0.32			
	38-60	30-40	1.50-1.70	<0.06	0.09-0.13	4.5-7.8	High----------	0.32			
8D2, 8E, 8F------ Hickory	0-9	19-25	1.30-1.50	0.6-2.0	0.20-0.22	4.5-7.3	Low-----------	0.37	5	6	.5-1
	9-52	27-35	1.45-1.65	0.6-2.0	0.15-0.19	4.5-6.0	Moderate------	0.37			
	52-60	15-32	1.50-1.70	0.6-2.0	0.11-0.19	5.1-8.4	Low-----------	0.37			
12--------------- Wynoose	0-8	15-25	1.25-1.45	0.2-0.6	0.22-0.24	4.5-7.8	Low-----------	0.43	3	6	.5-2
	8-20	12-18	1.30-1.50	0.06-0.2	0.18-0.20	3.6-7.3	Low-----------	0.43			
	20-35	35-42	1.40-1.60	<0.06	0.09-0.13	3.6-6.0	High----------	0.43			
	35-57	25-37	1.50-1.70	0.06-0.2	0.11-0.15	3.6-6.0	Moderate------	0.43			
	57-64	20-35	1.60-1.80	0.06-0.2	0.10-0.16	4.5-7.3	Moderate------	0.43			
13A, 13B--------- Bluford	0-9	20-27	1.30-1.50	0.6-2.0	0.22-0.24	4.5-7.3	Low-----------	0.43	3	6	1-2
	9-12	15-25	1.40-1.60	0.2-0.6	0.18-0.20	4.5-6.0	Low-----------	0.43			
	12-43	35-42	1.45-1.65	0.2-0.6	0.11-0.20	4.5-5.5	Moderate------	0.43			
	43-60	22-35	1.60-1.70	0.06-0.2	0.11-0.16	4.5-6.0	Moderate------	0.43			
14B-------------- Ava	0-15	20-27	1.30-1.50	0.6-2.0	0.20-0.23	4.5-7.3	Low-----------	0.43	4	6	.5-2
	15-24	22-33	1.40-1.60	0.6-2.0	0.18-0.21	4.5-5.5	Moderate------	0.43			
	24-48	24-35	1.50-1.70	0.2-0.6	0.18-0.21	4.5-5.5	Moderate------	0.43			
	48-60	20-30	1.55-1.80	<0.06	0.09-0.11	4.5-7.3	Low-----------	0.43			
14C2------------- Ava	0-10	20-27	1.30-1.50	0.6-2.0	0.20-0.23	4.5-7.3	Low-----------	0.43	4	6	.5-1
	10-15	22-33	1.40-1.60	0.6-2.0	0.18-0.21	4.5-5.5	Moderate------	0.43			
	15-38	24-35	1.50-1.70	0.2-0.6	0.18-0.21	4.5-5.5	Moderate------	0.43			
	38-54	20-30	1.55-1.80	<0.06	0.09-0.11	4.5-5.5	Low-----------	0.43			
	54-60	20-30	1.55-1.75	0.2-0.6	0.15-0.18	4.5-6.0	Low-----------	0.43			
15B, 15C2-------- Parke	0-9	18-27	1.25-1.40	0.6-2.0	0.22-0.24	5.1-6.5	Low-----------	0.37	5	5	.5-2
	9-46	22-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.0	Moderate------	0.37			
	46-60	18-30	1.55-1.65	0.6-2.0	0.16-0.18	4.5-5.5	Low-----------	0.28			
48--------------- Ebbert	0-13	20-30	1.20-1.40	0.2-0.6	0.22-0.24	5.1-7.3	Low-----------	0.37	5	6	2-3
	13-22	18-25	1.30-1.50	0.2-0.6	0.20-0.22	5.1-6.0	Low-----------	0.37			
	22-48	24-35	1.35-1.55	0.06-0.2	0.18-0.20	4.5-7.3	Moderate------	0.37			
	48-60	22-33	1.50-1.70	0.06-0.2	0.14-0.20	5.6-7.3	Moderate------	0.37			
120-------------- Huey	0-8	15-27	1.35-1.50	0.2-0.6	0.22-0.24	5.1-7.8	Low-----------	0.43	2	6	1-3
	8-10	11-25	1.40-1.55	0.06-0.2	0.20-0.22	5.1-7.8	Low-----------	0.43			
	10-15	20-35	1.40-1.60	0.06-0.2	0.10-0.18	5.6-8.4	Moderate------	0.43			
	15-49	25-35	1.45-1.65	<0.06	0.05-0.08	7.4-9.0	Moderate------	0.43			
	49-65	18-35	1.55-1.75	0.06-0.2	0.10-0.15	6.6-8.4	Moderate------	0.43			

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
134B, 134C2------ Camden	0-11	14-27	1.15-1.35	0.6-2.0	0.22-0.24	5.1-7.3	Low-----------	0.37	5	6	1-2
	11-24	22-35	1.35-1.55	0.6-2.0	0.16-0.20	5.1-7.3	Moderate-----	0.37			
	24-49	18-30	1.45-1.65	0.6-2.0	0.11-0.22	5.1-7.3	Low-----------	0.37			
	49-60	5-20	1.55-1.75	0.6-6.0	0.11-0.22	5.6-8.4	Low-----------	0.37			
138-------------- Shiloh	0-19	35-40	1.30-1.50	0.2-0.6	0.18-0.21	6.1-7.3	High----------	0.28	5	7	4-6
	19-48	35-45	1.35-1.55	0.2-0.6	0.09-0.18	6.1-7.8	High----------	0.28			
	48-60	25-45	1.30-1.50	0.2-0.6	0.18-0.20	6.1-8.4	High----------	0.28			
218-------------- Newberry	0-8	20-27	1.25-1.50	0.2-0.6	0.22-0.24	5.6-7.3	Low-----------	0.37	3	6	2-3
	8-18	18-25	1.30-1.55	0.2-0.6	0.20-0.22	4.5-6.0	Low-----------	0.37			
	18-40	27-35	1.30-1.55	0.06-0.2	0.18-0.20	4.5-6.0	Moderate-----	0.37			
	40-60	22-33	1.50-1.70	0.06-0.2	0.14-0.20	4.5-7.3	Moderate-----	0.37			
225-------------- Holton	0-10	5-18	1.20-1.45	0.6-2.0	0.15-0.20	5.6-7.3	Low-----------	0.37	5	5	1-3
	10-36	5-18	1.25-1.45	0.6-2.0	0.13-0.17	5.6-7.3	Low-----------	0.24			
	36-60	5-20	1.25-1.45	0.6-2.0	0.07-0.16	5.6-7.3	Low-----------	0.24			
226-------------- Wirt	0-8	10-18	1.30-1.45	0.6-2.0	0.17-0.20	5.6-7.3	Low-----------	0.37	5	5	.5-1
	8-49	7-18	1.40-1.55	0.6-2.0	0.15-0.20	5.6-7.3	Low-----------	0.24			
	49-60	3-12	1.25-1.50	2.0-20	0.03-0.10	5.6-7.3	Low-----------	0.17			
581-------------- Tamalco	0-9	20-27	1.30-1.50	0.6-2.0	0.22-0.24	4.5-7.8	Low-----------	0.43	3	6	1-3
	9-12	18-25	1.35-1.55	0.6-2.0	0.20-0.22	4.5-7.3	Low-----------	0.43			
	12-25	35-45	1.35-1.60	<0.06	0.09-0.14	4.5-7.3	High----------	0.43			
	25-53	20-35	1.50-1.70	<0.06	0.07-0.11	5.1-8.4	Moderate-----	0.43			
	53-60	20-30	1.55-1.75	<0.06	0.02-0.12	7.4-9.0	Moderate-----	0.43			
584B2------------ Grantfork	0-7	27-30	1.35-1.55	0.2-0.6	0.15-0.18	4.5-7.8	Low-----------	0.37	4	7	.5-1
	7-30	20-30	1.40-1.60	0.2-0.6	0.15-0.20	5.1-9.0	Low-----------	0.37			
	30-60	20-30	1.65-1.80	0.06-0.2	0.07-0.10	7.4-9.0	Moderate-----	0.37			
620-------------- Darmstadt	0-15	10-27	1.30-1.50	0.06-0.2	0.22-0.24	5.1-7.3	Low-----------	0.43	3	6	.5-2
	15-27	27-35	1.40-1.65	0.06-0.2	0.11-0.20	4.5-7.8	Moderate-----	0.43			
	27-36	27-35	1.40-1.65	<0.06	0.09-0.10	6.6-9.0	Moderate-----	0.43			
	36-60	15-30	1.50-1.70	<0.06	0.10-0.15	7.4-9.0	Low-----------	0.43			

TABLE 17.--SOIL AND WATER FEATURES

("Flooding" and "water table" and terms such as "frequent," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Soil name and map symbol	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft					
2----------------- Cisne	D	None---------	---	---	0-2.0	Perched	Feb-Jun	High-----	High-----	Moderate.
3A, 3B------------ Hoyleton	C	None---------	---	---	1.0-3.0	Apparent	Mar-Jun	High-----	High-----	High.
7C2, 7C3---------- Atlas	D	None---------	---	---	0-2.0	Perched	Apr-Jun	High-----	High-----	Moderate.
8D2, 8E, 8F------- Hickory	C	None---------	---	---	>6.0	---	---	Moderate	Moderate	Moderate.
12---------------- Wynoose	D	None---------	---	---	0-2.0	Perched	Mar-Jun	High-----	High-----	High.
13A, 13B---------- Bluford	C	None---------	---	---	1.0-3.0	Perched	Mar-Jun	High-----	High-----	High.
14B, 14C2--------- Ava	C	None---------	---	---	1.5-3.5	Perched	Mar-Jun	High-----	Moderate	High.
15B, 15C2--------- Parke	B	None---------	---	---	>6.0	---	---	High-----	Moderate	High.
48---------------- Ebbert	C/D	None---------	---	---	+.5-2.0	Apparent	Apr-Jul	High-----	High-----	Moderate.
120--------------- Huey	D	None---------	---	---	0-2.0	Perched	Mar-Jun	High-----	High-----	Low.
134B, 134C2------- Camden	B	None---------	---	---	>6.0	---	---	High-----	Low------	Moderate.
138--------------- Shiloh	B/D	None---------	---	---	+1-2.0	Apparent	Mar-Jun	High-----	High-----	Low.
218--------------- Newberry	C	None---------	---	---	0-2.0	Apparent	Mar-Jun	High-----	High-----	High.
225--------------- Holton	C	Frequent----	Brief-----	Jan-Jun	1.0-3.0	Apparent	Nov-Jun	High-----	Moderate	High.
226--------------- Wirt	B	Frequent----	Very brief	Mar-May	>6.0	---	---	Moderate	Low------	Moderate.
581--------------- Tamalco	D	None---------	---	---	2.5-5.0	Apparent	Feb-Apr	High-----	High-----	Low.
584B2------------- Grantfork	D	None---------	---	---	1.0-3.0	Perched	Jan-May	High-----	High-----	Low.
620--------------- Darmstadt	D	None---------	---	---	1.0-3.0	Perched	Feb-May	High-----	High-----	High.

TABLE 18.--ENGINEERING INDEX TEST DATA

(MAX means maximum dry density; OPT, optimum moisture; LL, liquid limit; PI, plasticity index; and UN, Unified)

Soil name and location	Sample number	Horizon designation	Depth	Moisture density MAX	Moisture density OPT	Percentage passing sieve No. 4	No. 10	No. 40	No. 200	LL	PI	Classification AASHTO	Classification UN
			In	Lb/ cu ft	Pct					Pct			
Atlas silt loam:	83IL-049-6-1	A	0-6	104	19	100	99	95	76	33	13	A-6	CL
260 feet north and	83IL-049-6-4	Btg3	17-34	104	20	100	99	94	73	60	41	A-7-6	CH
425 feet east of													
the southwest													
corner of sec. 35,													
T. 6 N., R. 5 E.													
Camden silt loam:	80IL-049-48-1	Ap	0-8	106	16	100	100	99	90	26	3	A-4	ML
150 feet south and	80IL-049-48-4	Bt2	15-24	107	19	100	100	100	93	38	17	A-6	CL
212 feet east of	80IL-049-48-9	2BC	49-60	119	13	100	100	99	49	23	6	A-4	CL-ML
the center of sec.													
30, T. 9 N., R. 6 E.													
Cisne silt loam:	82IL-049-9-3	E2	11-18	110	16	100	98	92	84	24	7	A-4	CL-ML
1,330 feet north and	82IL-049-9-5	Btg1	23-31	90	25	100	100	99	94	63	38	A-7-6	CH
1,200 feet west of	82IL-049-9-8	2BCg	54-65	110	16	98	97	94	86	39	22	A-6	CL
the southeast corner													
of sec. 33, T. 6 N.,													
R. 4 E.													
Holton silt loam:	82IL-049-1-3	C2	18-28	119	12	99	97	91	58	18	2	A-4	CL
1,360 feet west and													
1,260 feet south of													
the northeast corner													
of sec. 25, T. 8 N.,													
R. 5 E.													
Hoyleton silt loam:	80IL-049-4-1	Ap	0-9	103	19	100	99	95	92	33	12	A-6	CL
550 feet east and	80IL-049-4-4	Bt1	15-23	93	24	100	100	99	98	52	27	A-7-6	CH
690 feet north of	80IL-049-4-8	2C	52-60	118	13	100	100	97	77	24	9	A-4	CL
the center of sec.													
8, T. 7 N., R. 4 E.													
Newberry silt loam:	83IL-049-5-1	Ap	0-8	107	17	100	99	97	89	31	7	A-4	ML
2,250 feet south and	83IL-049-5-5	Btg1	23-34	101	22	100	100	98	93	44	24	A-7-6	CL
50 feet west of the													
northeast corner of													
sec. 14, T. 8 N.,													
R. 4 E.													
Shiloh silty clay													
loam:	61IL-049-4-2	A	7-19	102	21	100	100	99	95	47	25	A-7-6	CL
1,580 feet north and	61IL-049-4-3	Bg1	19-35	101	21	100	100	100	96	62	42	A-7-6	CH
50 feet east of the													
southwest corner of													
sec. 11, T. 8 N.,													
R. 4 E.													
Wynoose silt loam:	82IL-049-7-2	Eg1	5-11	108	16	100	98	94	86	23	6	A-4	CL-ML
1,528 feet north and	82IL-049-7-5	Btg1	21-34	96	24	100	100	99	94	59	37	A-7-6	CH
2,100 feet east of	82IL-049-7-7	2BCg	43-65	109	18	100	100	97	88	37	19	A-6	CL
the southwest corner													
of sec. 22, T. 8 N.,													
R. 5 E.													

TABLE 19.--CLASSIFICATION OF THE SOILS

(An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series)

Soil name	Family or higher taxonomic class
Atlas	Fine, montmorillonitic, mesic, sloping Aeric Ochraqualfs
*Ava	Fine-silty, mixed, mesic Typic Fragiudalfs
Bluford	Fine, montmorillonitic, mesic Aeric Ochraqualfs
Camden	Fine-silty, mixed, mesic Typic Hapludalfs
Cisne	Fine, montmorillonitic, mesic Mollic Albaqualfs
Darmstadt	Fine-silty, mixed, mesic Albic Natraqualfs
Ebbert	Fine-silty, mixed, mesic Argiaquic Argialbolls
Grantfork	Fine-loamy, mixed, mesic, sloping Aeric Ochraqualfs
Hickory	Fine-loamy, mixed, mesic Typic Hapludalfs
Holton	Coarse-loamy, mixed, nonacid, mesic Aeric Fluvaquents
Hoyleton	Fine, montmorillonitic, mesic Aquollic Hapludalfs
Huey	Fine-silty, mixed, mesic Typic Natraqualfs
Newberry	Fine-silty, mixed, mesic Mollic Ochraqualfs
Parke	Fine-silty, mixed, mesic Ultic Hapludalfs
Shiloh	Fine, montmorillonitic, mesic Cumulic Haplaquolls
Tamalco	Fine, montmorillonitic, mesic Typic Natrudalfs
Wirt	Coarse-loamy, mixed, nonacid, mesic Typic Udifluvents
Wynoose	Fine, montmorillonitic, mesic Typic Albaqualfs

* U.S. Government Printing Office: 1991-281-361/L0015

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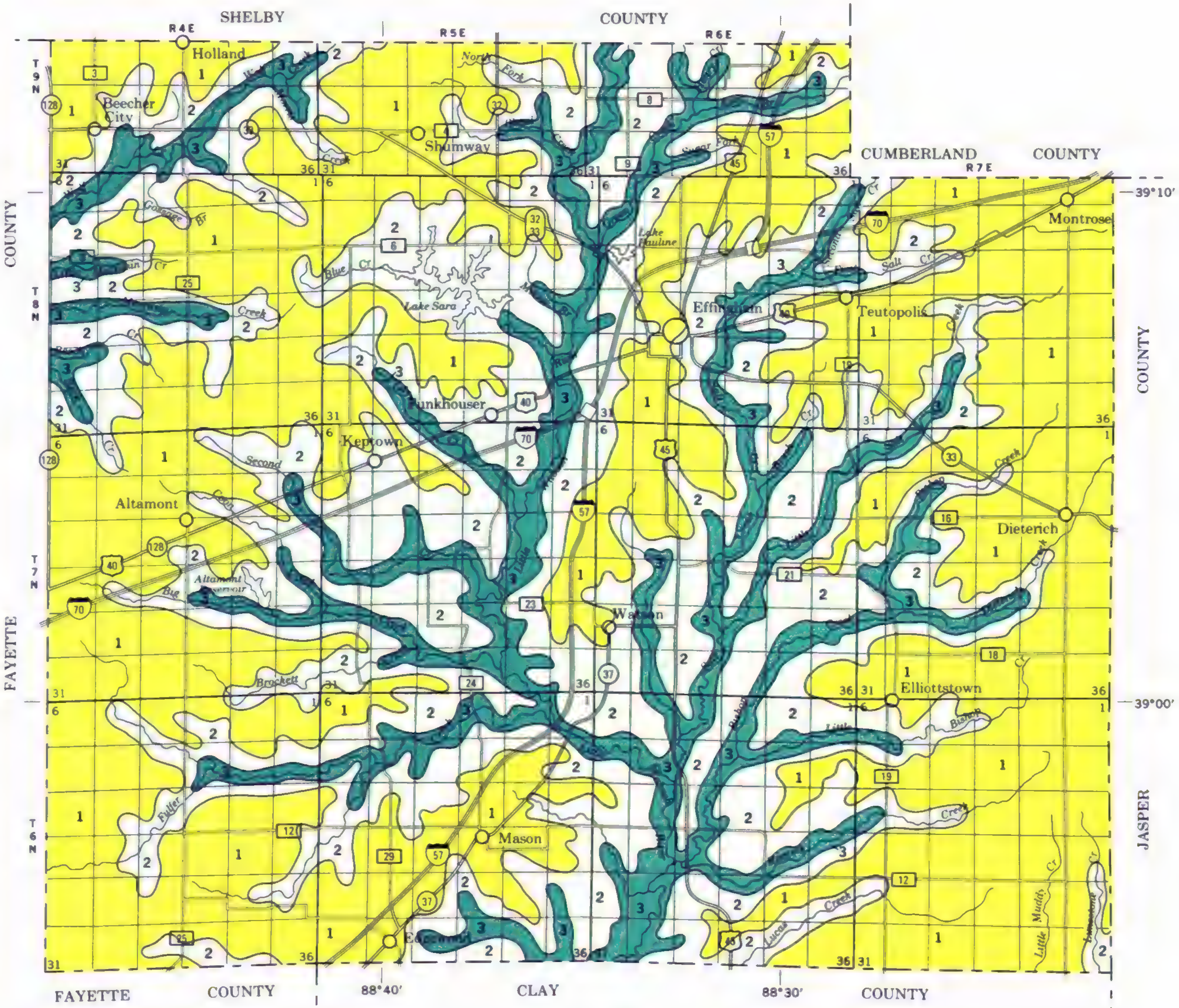


LEGEND *

1 — CISNE-HOYLETON-NEWBERRY ASSOCIATION: Nearly level and gently sloping, poorly drained and somewhat poorly drained, very slowly permeable and slowly permeable, silty soils formed in loess and loamy sediments; on uplands

2 — BLUFORD-HICKORY-AVA ASSOCIATION: Nearly level to steep, well drained to somewhat poorly drained, moderately permeable to very slowly permeable, silty and loamy soils formed in loess and loamy sediments or in glacial till; on uplands

3 — HOLTON-WIRT ASSOCIATION: Nearly level, somewhat poorly drained and well drained, moderately permeable to rapidly permeable, silty and loamy soils formed in loamy and sandy alluvium; on bottom land

* Unless otherwise indicated, texture terms in the descriptive headings refer to the surface layer of the major soils in the associations.

Compiled 1990

N

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
ILLINOIS AGRICULTURAL EXPERIMENT STATION

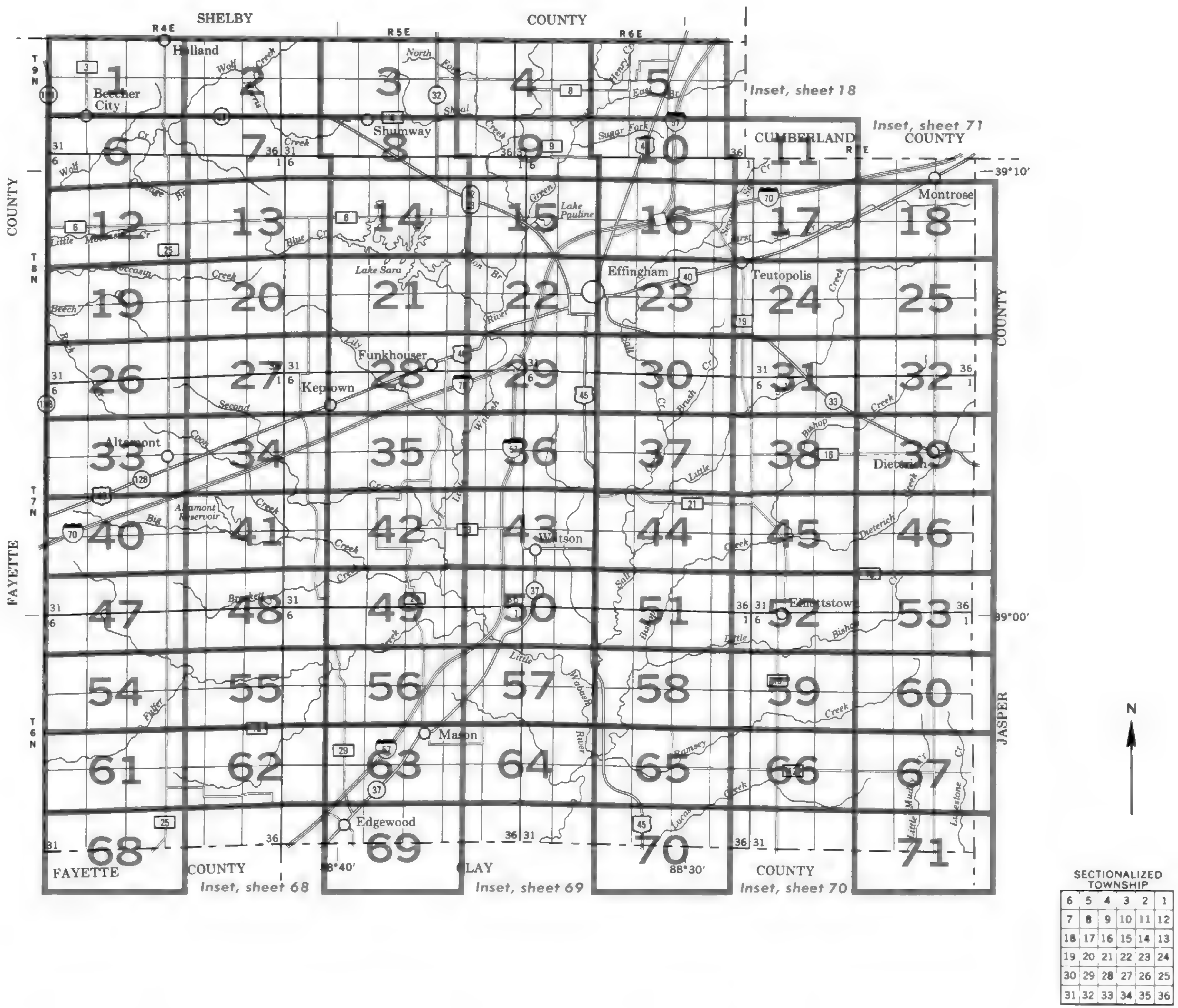
GENERAL SOIL MAP

EFFINGHAM COUNTY, ILLINOIS

Scale 1:190,080

1 0 1 2 3 Miles

1 0 3 6 Km



INDEX TO MAP SHEETS
EFFINGHAM COUNTY, ILLINOIS

Scale 1:190,080

1 0 1 2 3 Miles

1 0 3 6 Km

SOIL LEGEND

Map symbols consist of numbers or a combination of numbers and letters. The initial numbers represent the kind of soil. A capital letter following these numbers indicates the class of slope. Symbols without a slope letter are for nearly level soils. A final number of 2 following the slope letter indicates that the soil is moderately eroded and 3 that it is severely eroded.

SYMBOL	NAME
2	Cisne silt loam
3A	Hoyleton silt loam, 0 to 2 percent slopes
3B	Hoyleton silt loam, 2 to 7 percent slopes
7C2	Atlas silt loam, 4 to 12 percent slopes, eroded
7C3	Atlas silt loam, 4 to 12 percent slopes, severely eroded
8D2	Hickory silt loam, 10 to 15 percent slopes, eroded
8E	Hickory silt loam, 15 to 20 percent slopes
8F	Hickory silt loam, 20 to 50 percent slopes
12	Wynoose silt loam
13A	Bluford silt loam, 0 to 2 percent slopes
13B	Bluford silt loam, 2 to 5 percent slopes
14B	Ava silt loam, 1 to 5 percent slopes
14C2	Ava silt loam, 5 to 12 percent slopes, eroded
15B	Parke silt loam, 1 to 5 percent slopes
15C2	Parke silt loam, 5 to 10 percent slopes, eroded
48	Ebbert silt loam
120	Huey silt loam
134B	Camden silt loam, 1 to 5 percent slopes
134C2	Camden silt loam, 5 to 10 percent slopes, eroded
138	Shiloh silty clay loam
218	Newberry silt loam
225	Holton silt loam
226	Wirt loam
581	Tamalco silt loam
584B2	Grantfork silty clay loam, 2 to 5 percent slopes, eroded
620	Darmstadt silt loam

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- County or parish
- Field sheet matchline & neatline

AD HOC BOUNDARY (label)

- Small airport, airfield, park, oilfield, cemetery — Davis Airstrip

STATE COORDINATE TICK — 890 000 FEET

LAND DIVISION CORNERS (sections)

ROADS

- Divided (median shown if scale permits)
- Other roads

ROAD EMBLEMS & DESIGNATIONS

- Interstate — 57
- Federal — 45
- State — 33

RAILROAD

DAMS

- Large (to scale)
- Medium or small — water

PITS

- Gravel pit

MISCELLANEOUS CULTURAL FEATURES

- Church
- School
- Wells, oil or gas

WATER FEATURES

DRAINAGE

- Perennial, single line
- Intermittent
- Drainage end
- Drainage ditch

LAKES, PONDS AND RESERVOIRS

- Perennial — water

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS — 2 3A

ESCARPMENTS

- Other than bedrock (points down slope)

SHORT STEEP SLOPE

SOIL SAMPLE SITE — S

MISCELLANEOUS

- Slick or scabby spot (sodic)
- Rock outcrop (includes sandstone and shale)
- Sandy spot
- Severely eroded spot
- Oil waste land

EFFINGHAM COUNTY, ILLINOIS NO. 1

This soil survey map is compiled on 1981 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF EFFINGHAM COUNTY, ILLINOIS — SHEET NUMBER 2

This soil survey map is compiled on 1981 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

EFFINGHAM COUNTY, ILLINOIS NO. 3

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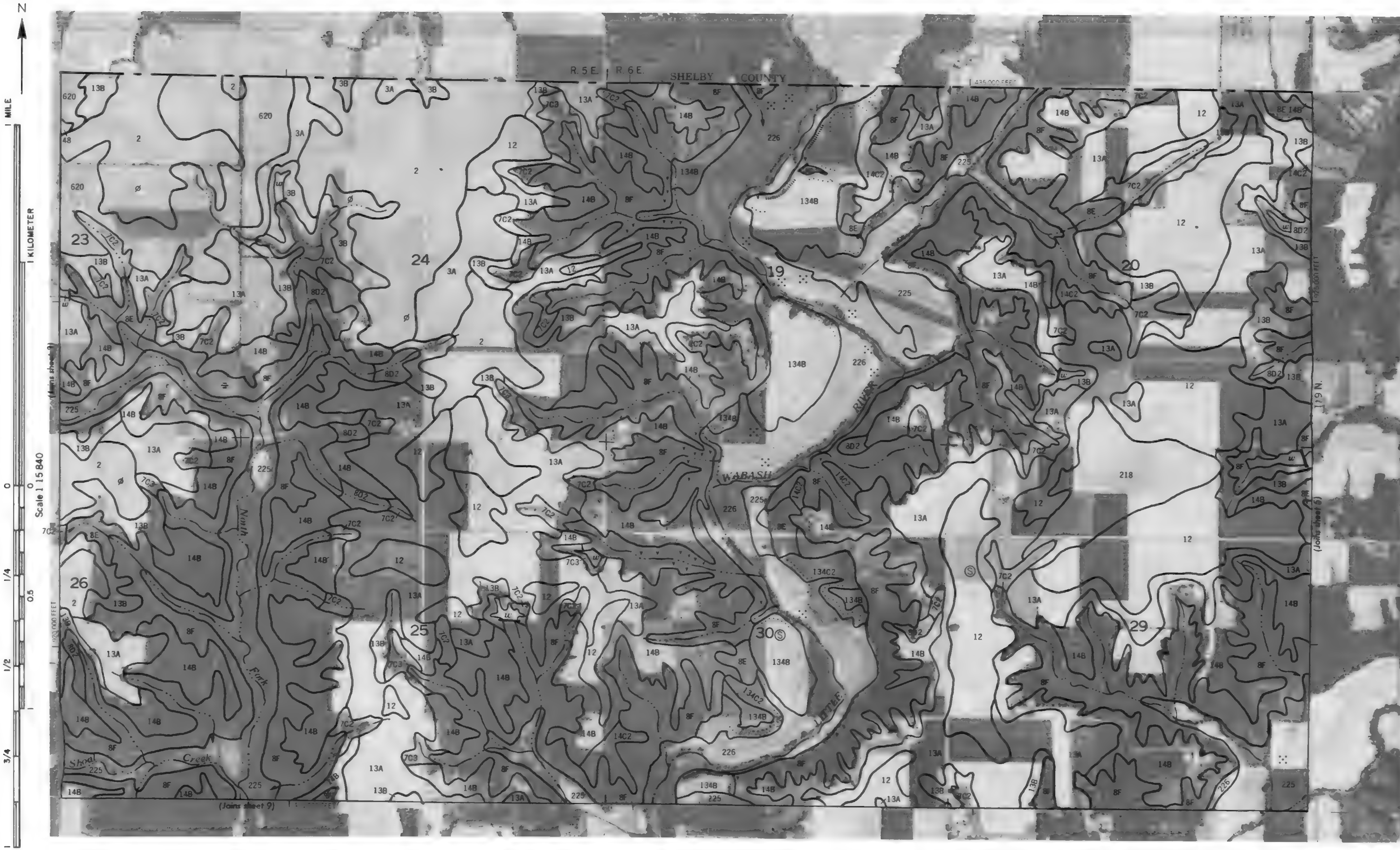
SOIL MAP OF EFFINGHAM COUNTY, ILLINOIS — SHEET NUMBER 4



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EFFINGHAM COUNTY, ILLINOIS NO. 4

EFFINGHAM COUNTY, ILLINOIS NO. 5

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Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF EFFINGHAM COUNTY, ILLINOIS — SHEET NUMBER 6

N

1 MILE

1 KILOMETER

Scale 1:15 840

0 1/4 1/2 3/4

0 0.5 1

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EFFINGHAM COUNTY, ILLINOIS NO. 6

EFFINGHAM COUNTY, ILLINOIS NO. 7

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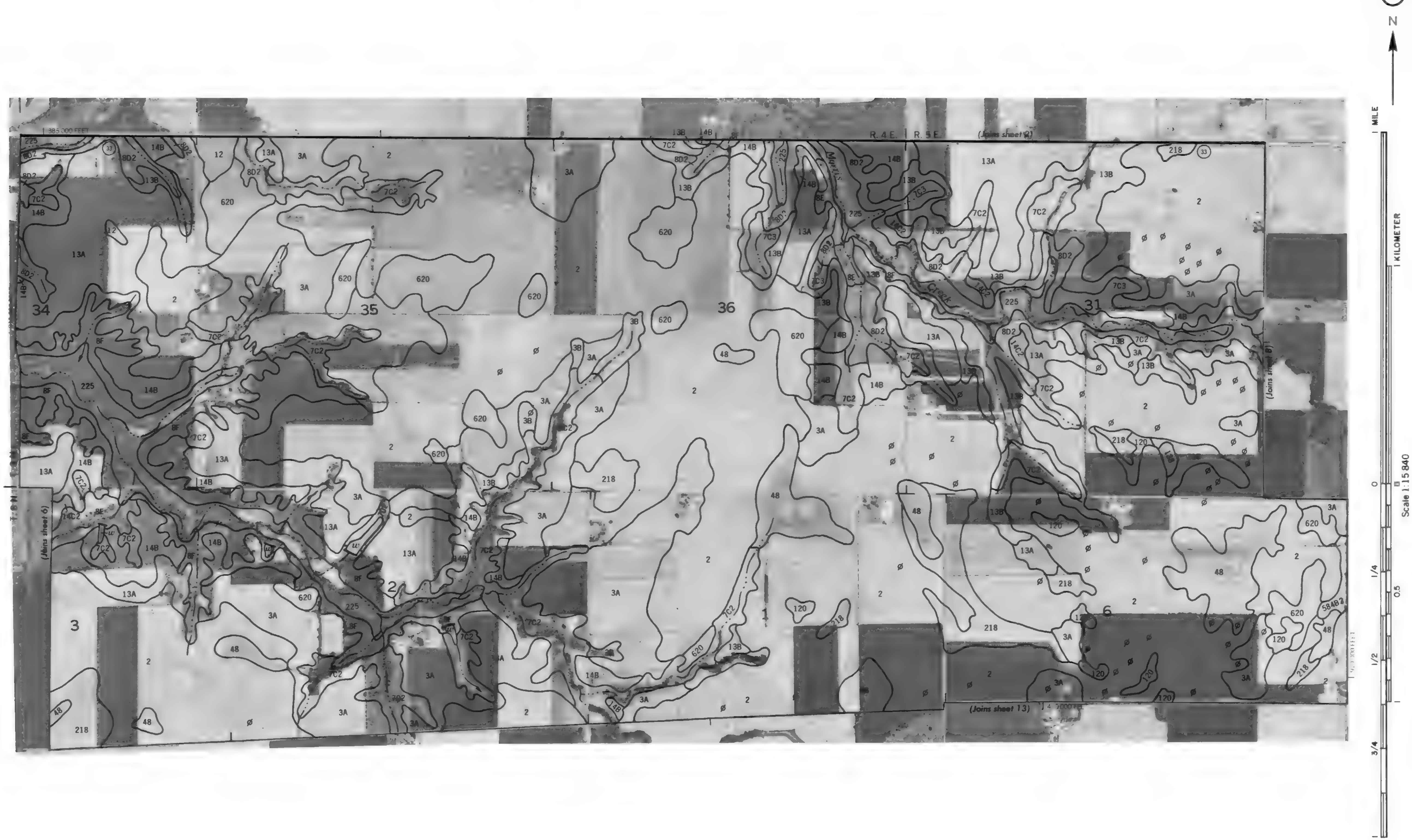

8

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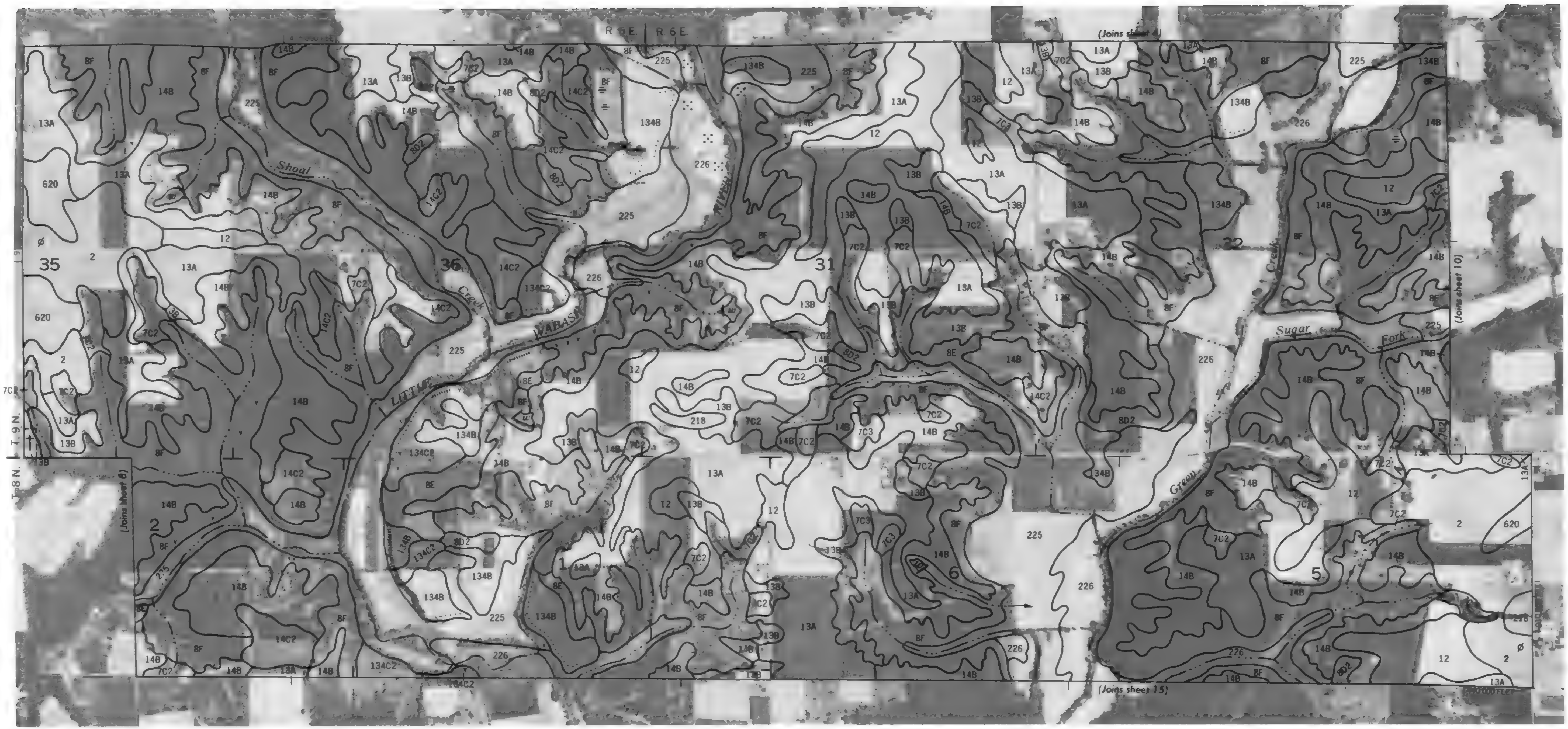
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

9

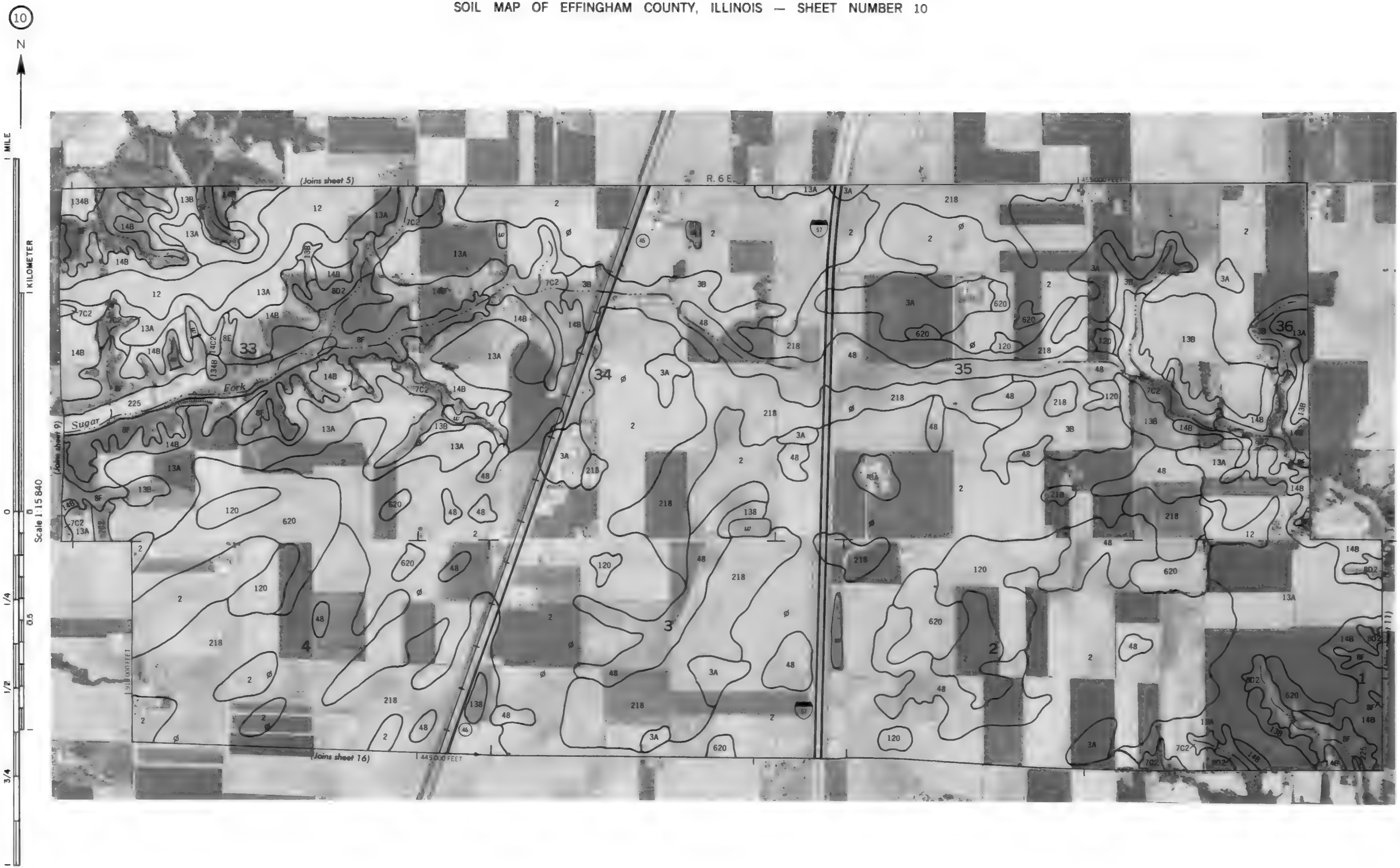
N



EFFINGHAM COUNTY, ILLINOIS NO. 9
This soil survey map is compiled on 1981 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies
Coordinate grid ticks and land division corners, if shown, are approximately positioned

1 MILE
1 KILOMETER
Scale 1:15 840
0
1/4
1/2
3/4
0
0.5

SOIL MAP OF EFFINGHAM COUNTY, ILLINOIS — SHEET NUMBER 10



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Coordinate grid ticks and land division corners, if shown, are approximately positioned.

EFFINGHAM COUNTY, ILLINOIS NO. 10

EFFINGHAM COUNTY, ILLINOIS NO. 11

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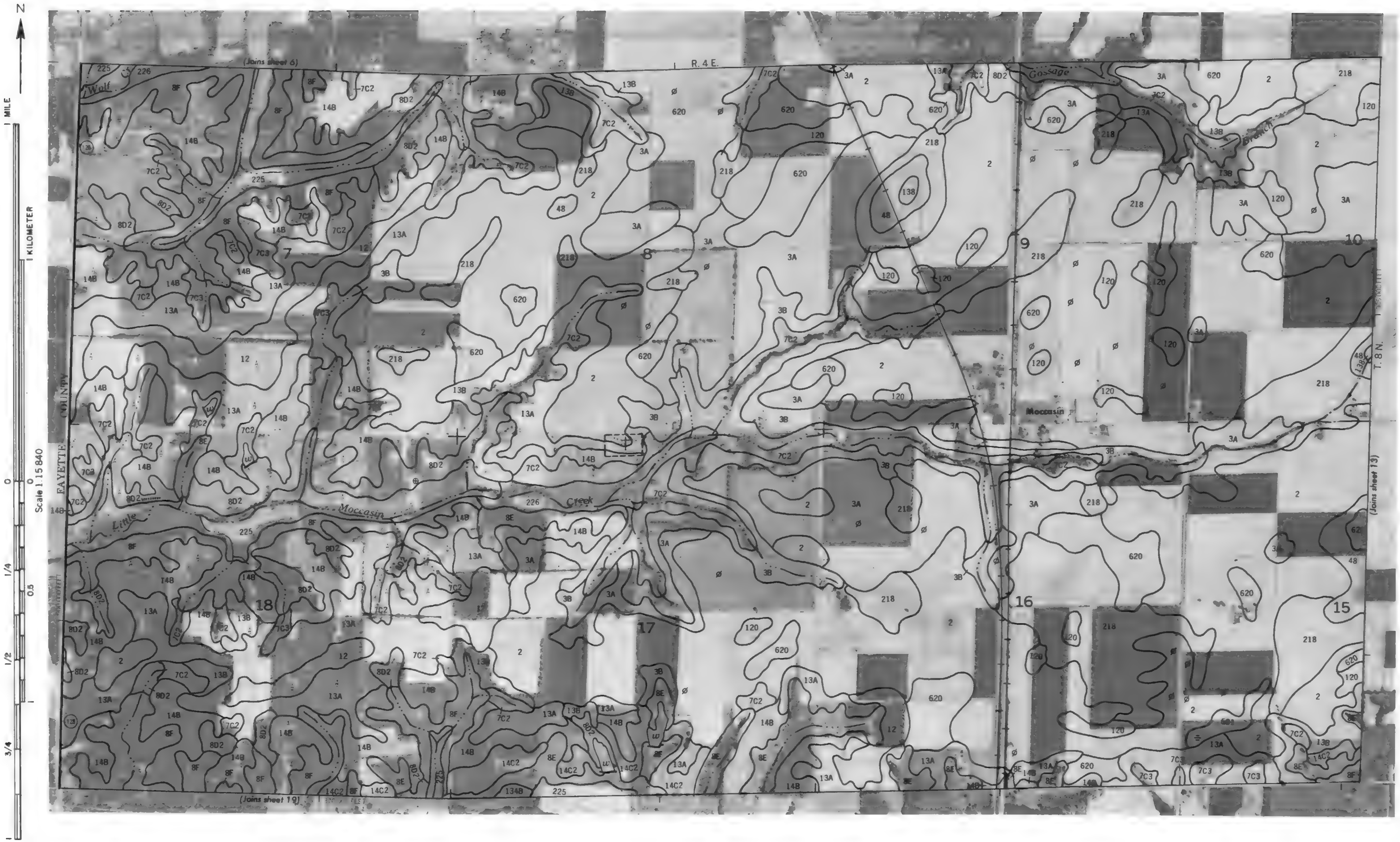
Coordinate grid ticks and land division corners, if shown, are approximately positioned

SOIL MAP OF EFFINGHAM COUNTY, ILLINOIS — SHEET NUMBER 12



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EFFINGHAM COUNTY, ILLINOIS NO. 12

13

EFFINGHAM COUNTY, ILLINOIS NO. 13

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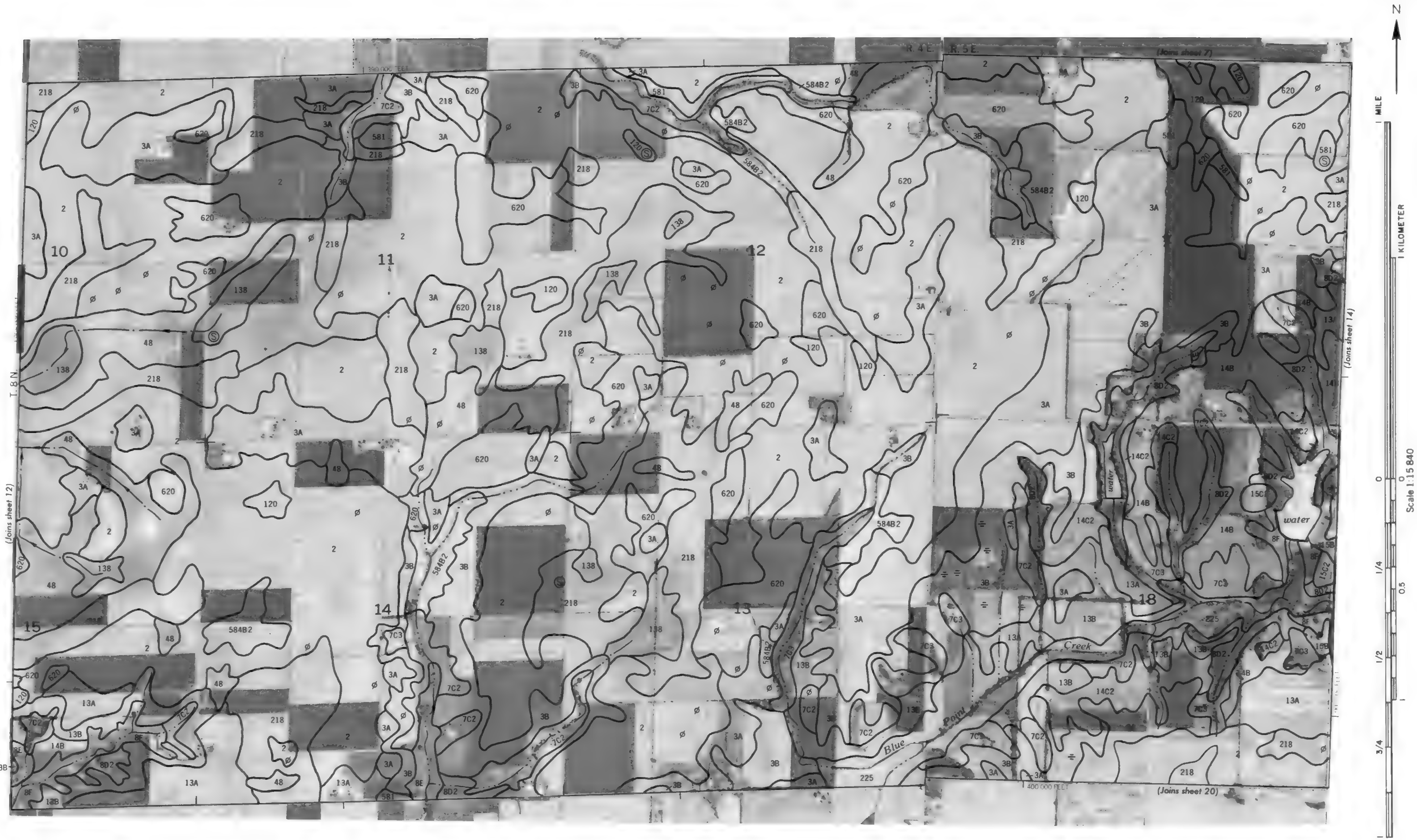

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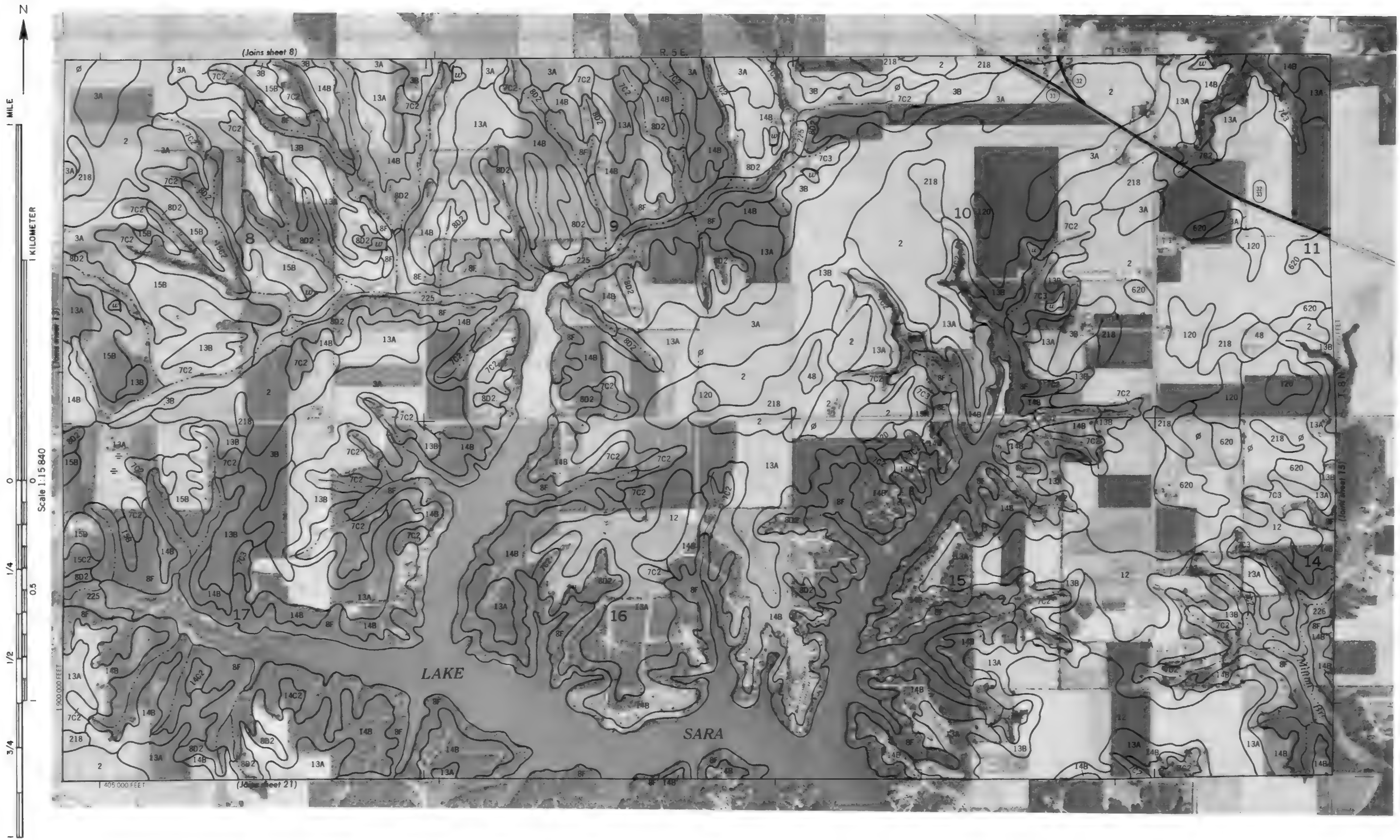

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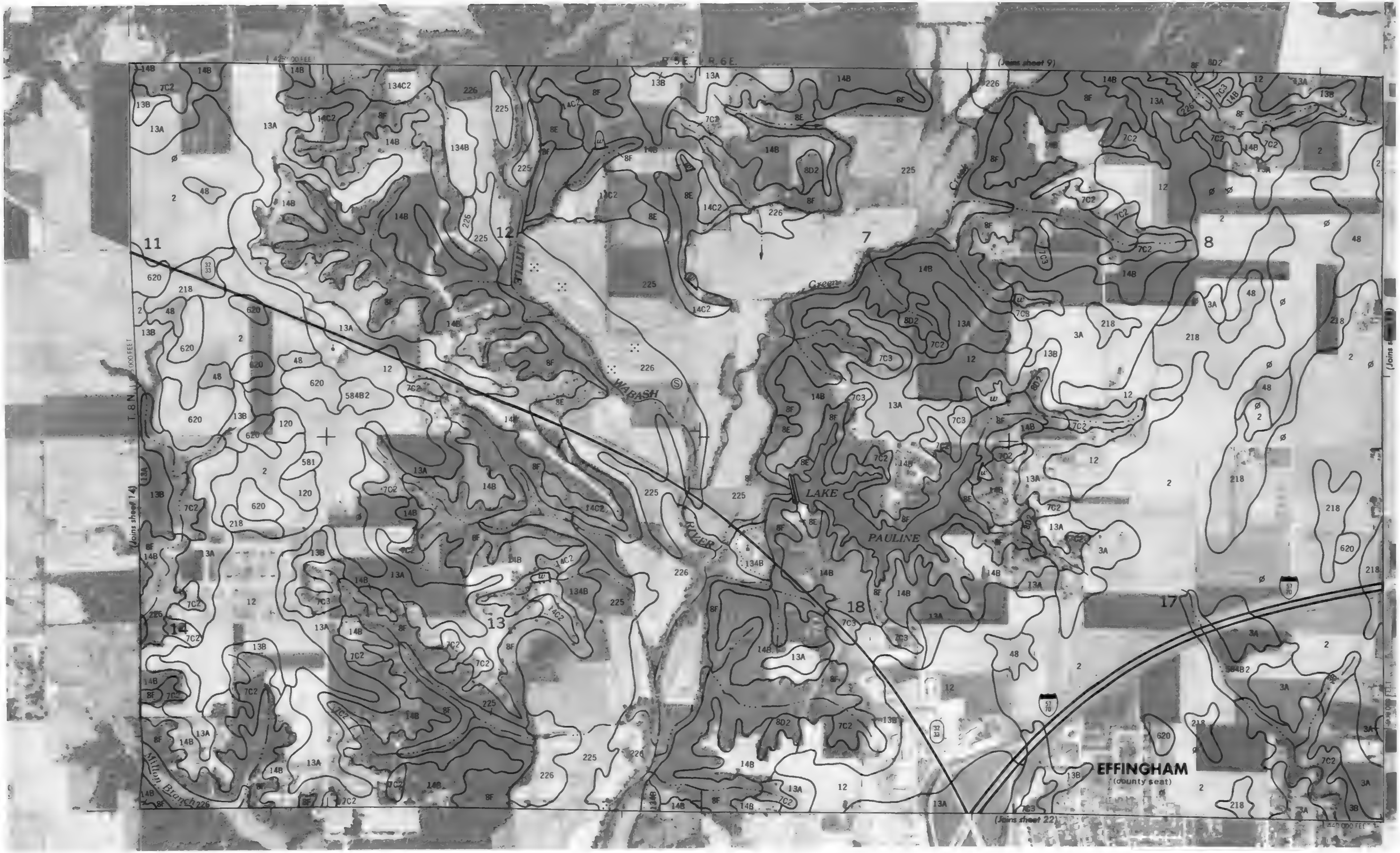

N

1 MILE

1 KILOMETER

Scale 1:15 840

EFFINGHAM COUNTY, ILLINOIS NO. 15

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Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF EFFINGHAM COUNTY, ILLINOIS — SHEET NUMBER 16

N

1 MILE

1 KILOMETER

Scale 1:15 840

0 1/4 1/2 3/4

0.5

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Coordinate grid ticks and land division corners, if shown, are approximately positioned

EFFINGHAM COUNTY, ILLINOIS NO. 16

SOIL MAP OF EFFINGHAM COUNTY, ILLINOIS — SHEET NUMBER 17

N

Scale 1:15 840

MILE: 0, 1/4, 1/2, 3/4, 1

KILOMETER: 0, 0.5, 1

EFFINGHAM COUNTY, ILLINOIS NO. 17

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Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF EFFINGHAM COUNTY, ILLINOIS — SHEET NUMBER 18

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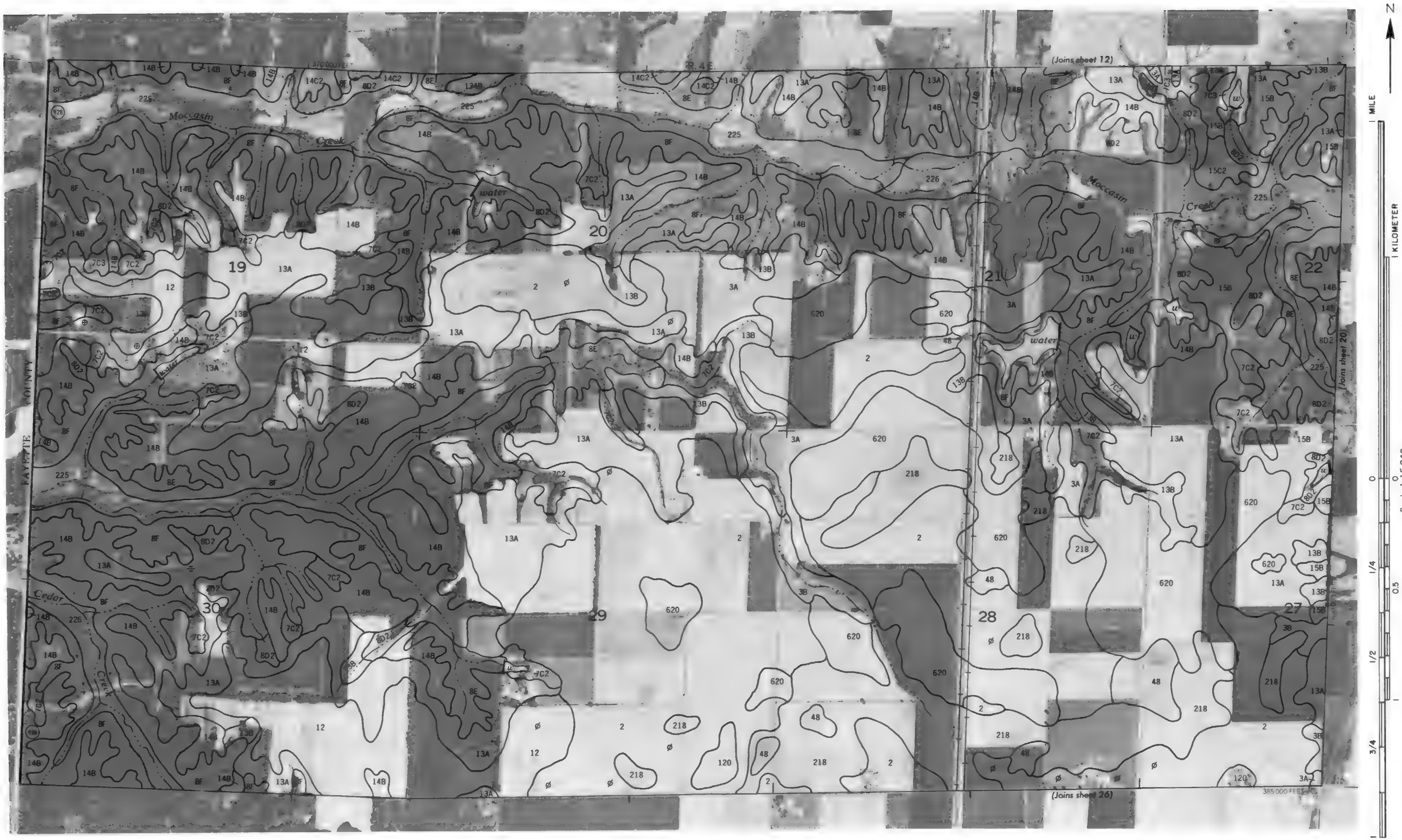
Coordinate grid ticks and land division corners, if shown, are approximately positioned



EFFINGHAM COUNTY, ILLINOIS NO. 19

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SOIL MAP OF EFFINGHAM COUNTY, ILLINOIS — SHEET NUMBER 20

N

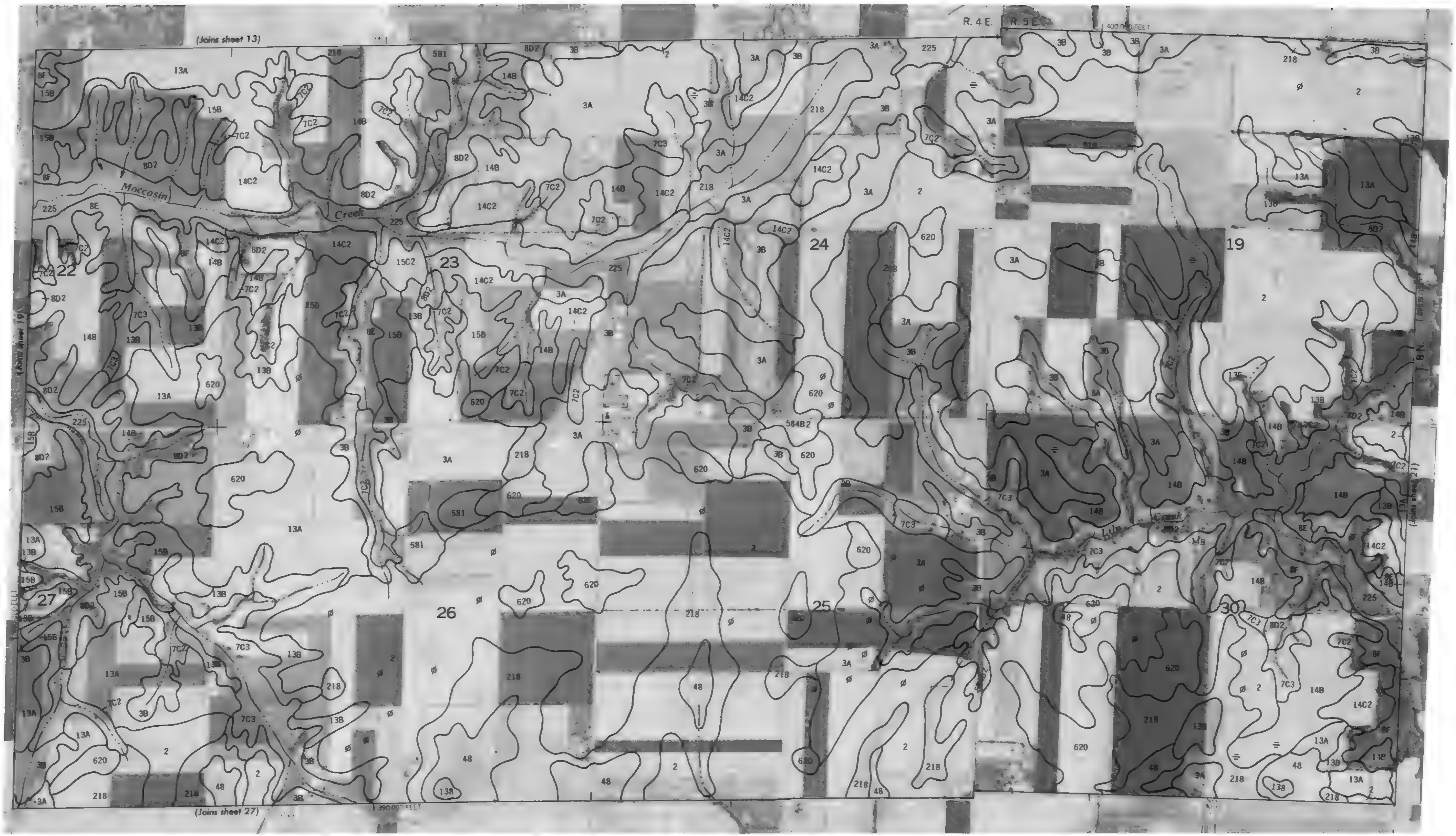
1 MILE

1 KILOMETER

Scale 1:15 840

0 1/4 1/2 3/4

0.5



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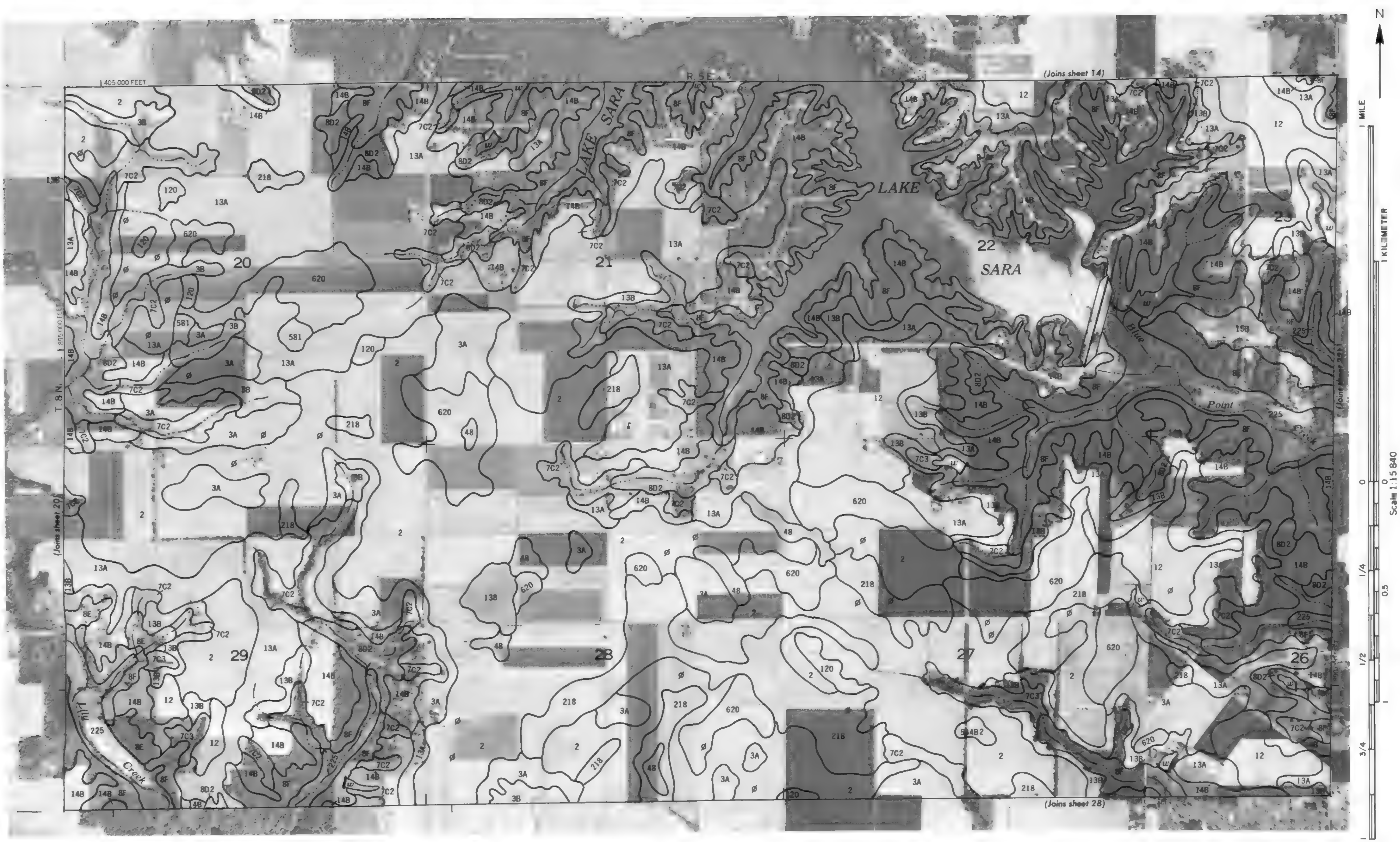
EFFINGHAM COUNTY, ILLINOIS NO. 20



EFFINGHAM COUNTY, ILLINOIS NO. 21

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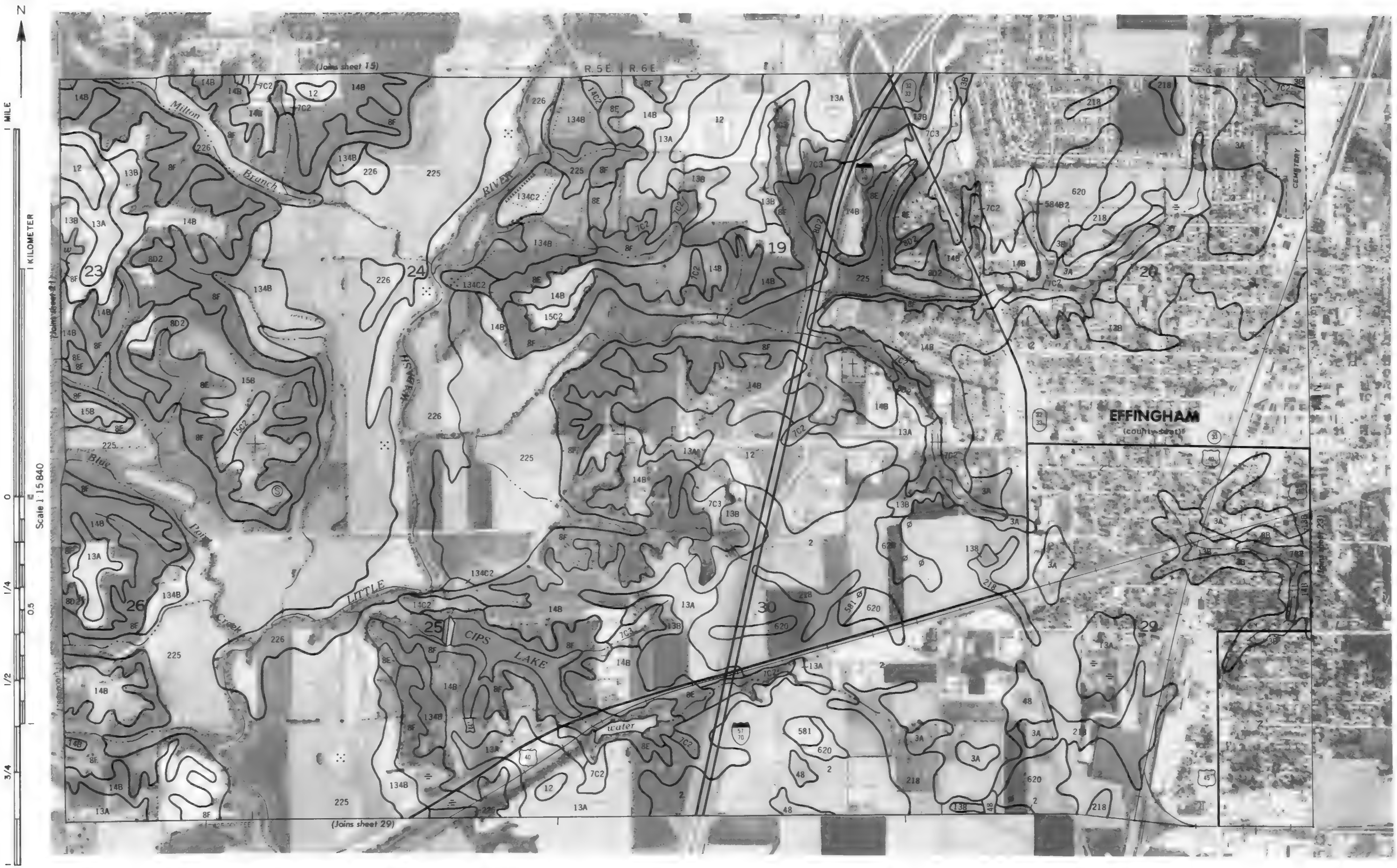
SOIL MAP OF EFFINGHAM COUNTY, ILLINOIS — SHEET NUMBER 22



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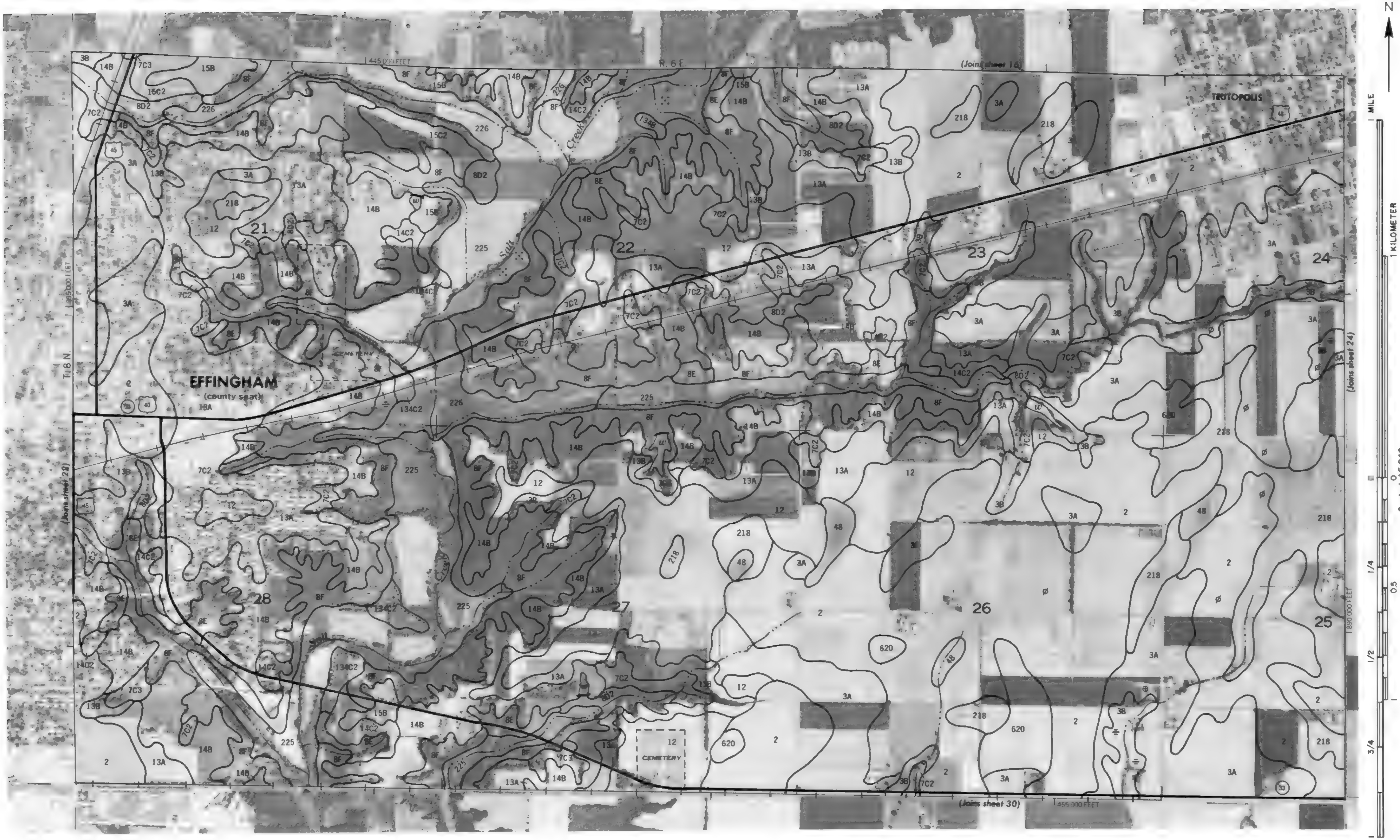

EFFINGHAM COUNTY, ILLINOIS NO. 23

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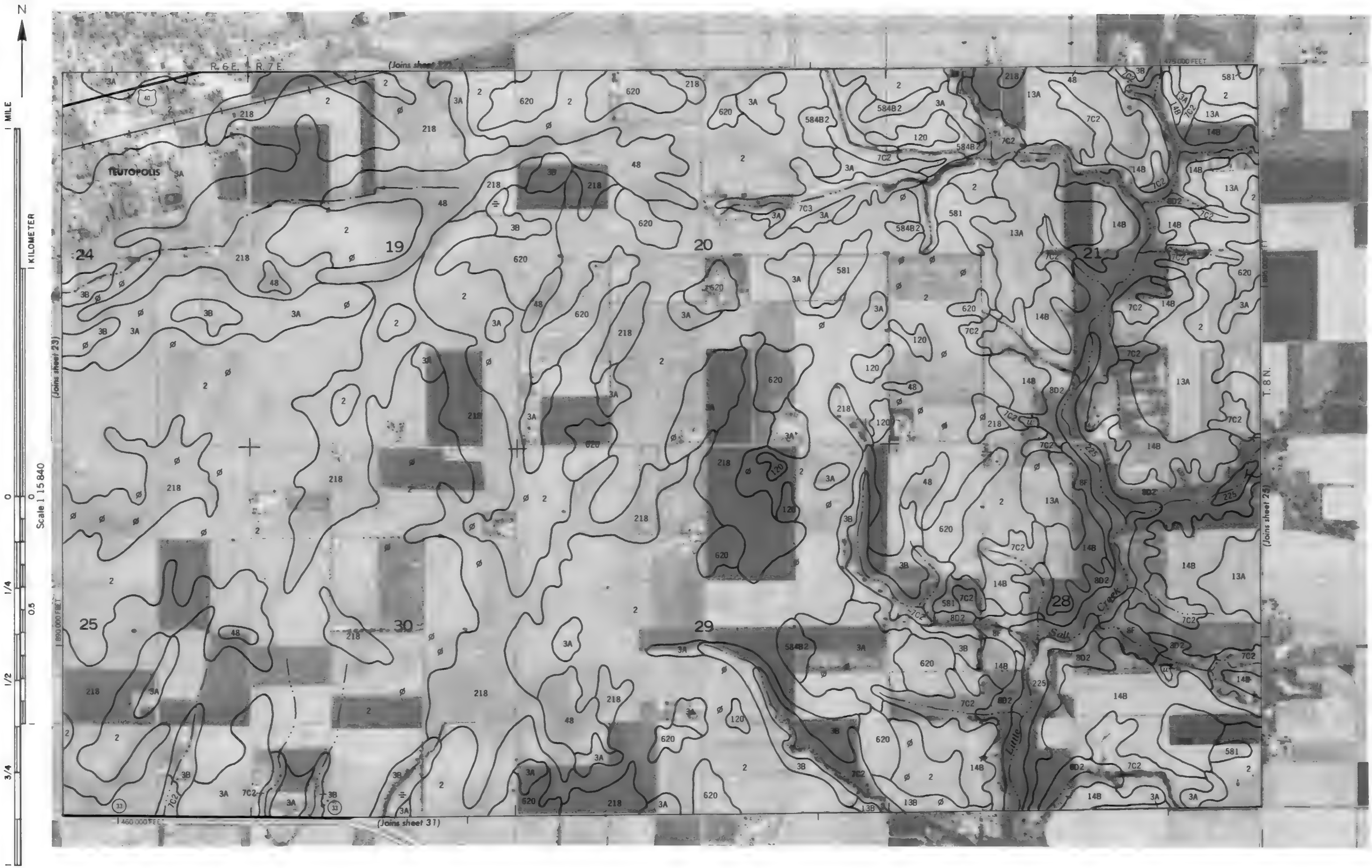
SOIL MAP OF EFFINGHAM COUNTY, ILLINOIS — SHEET NUMBER 24



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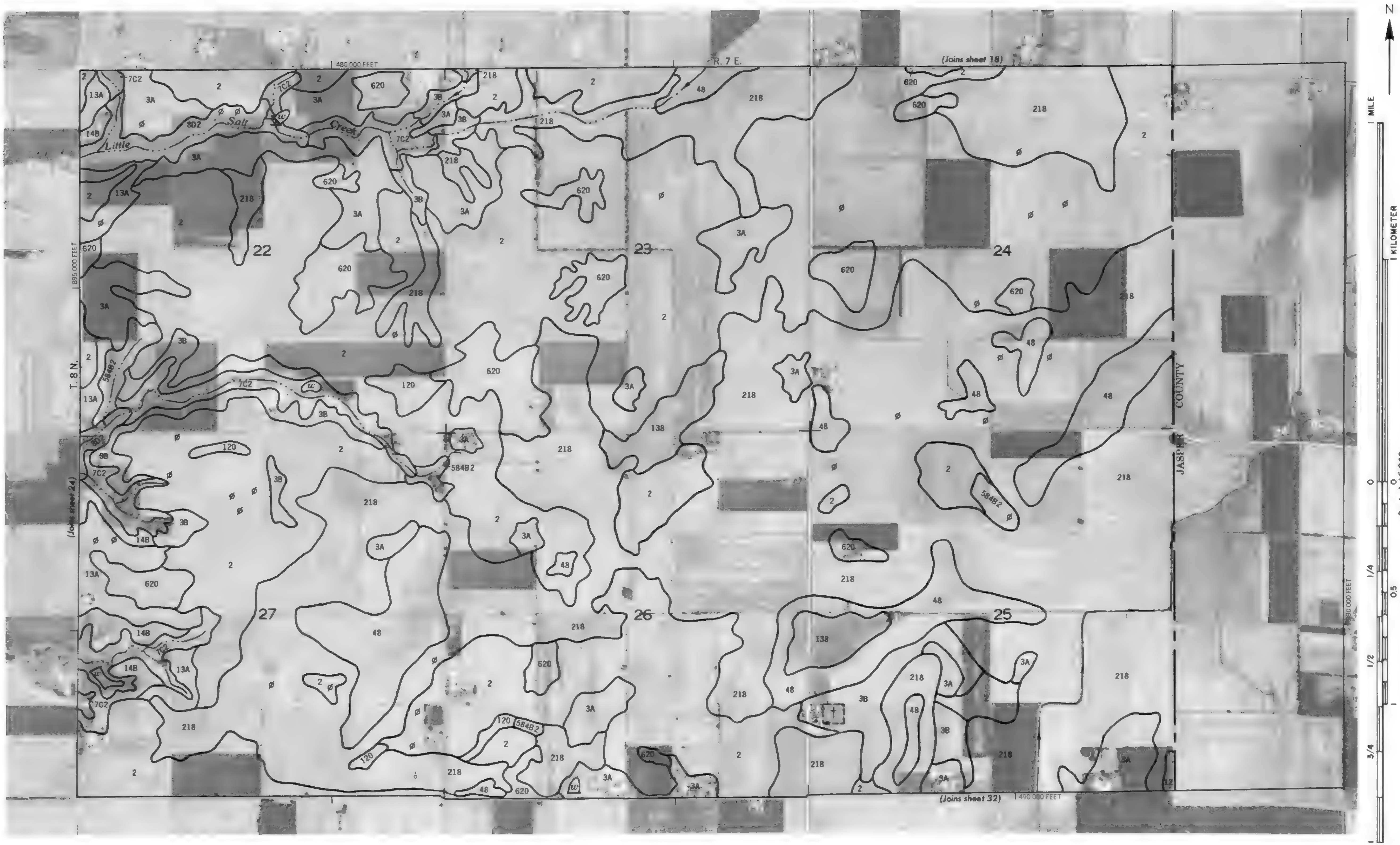

EFFINGHAM COUNTY, ILLINOIS NO. 25

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Coordinate grid ticks and land division corners, if shown, are approximately positioned

SOIL MAP OF EFFINGHAM COUNTY, ILLINOIS — SHEET NUMBER 26

26

N

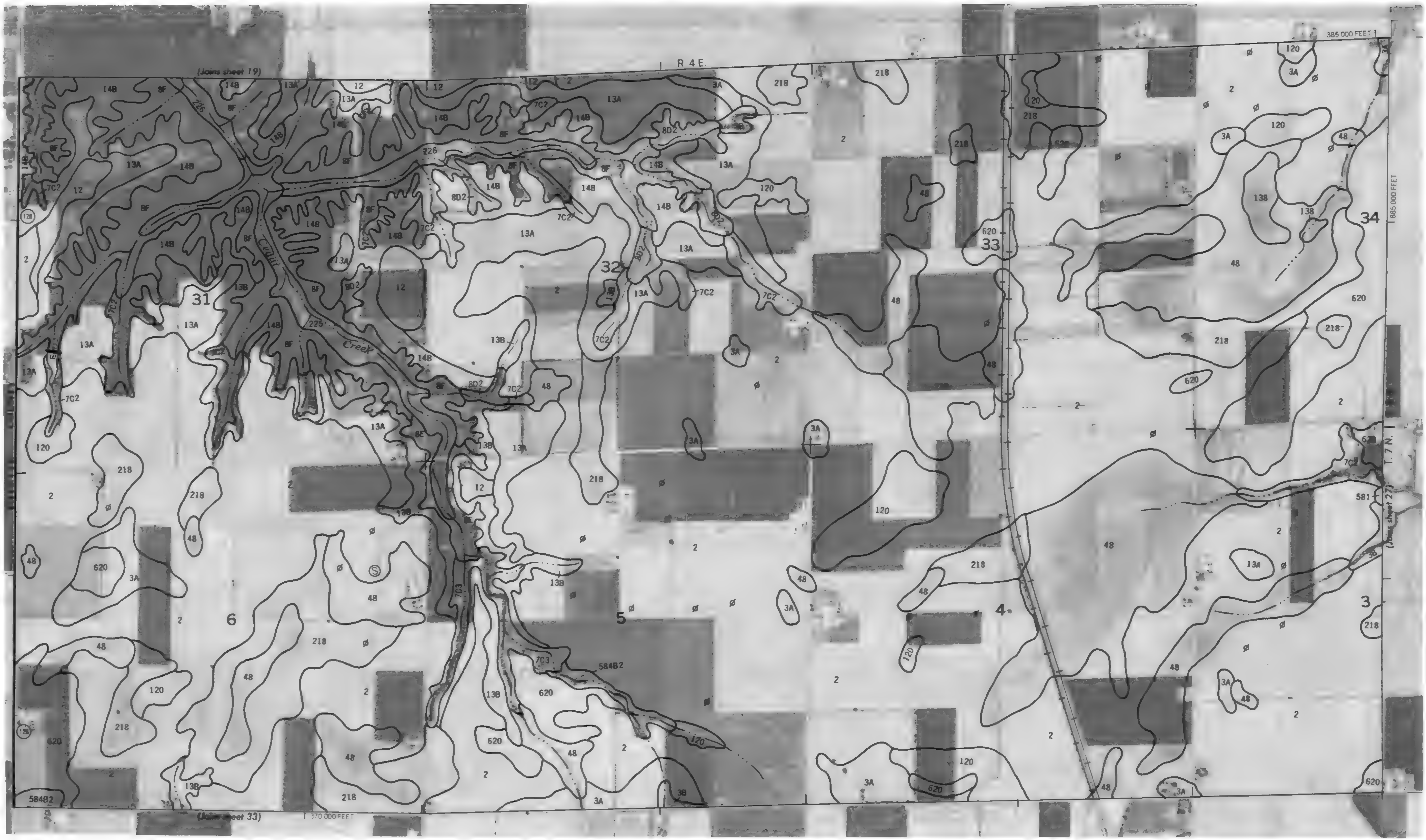
MILE

KILOMETER

Scale 1:15 840

0 1/4 1/2 3/4 1

0 0.5 1



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EFFINGHAM COUNTY, ILLINOIS NO. 27

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Coordinate grid ticks and land division corners, if shown, are approximately positioned.

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Coordinate grid ticks and land division corners, if shown, are approximately positioned.

EFFINGHAM COUNTY, ILLINOIS NO. 29

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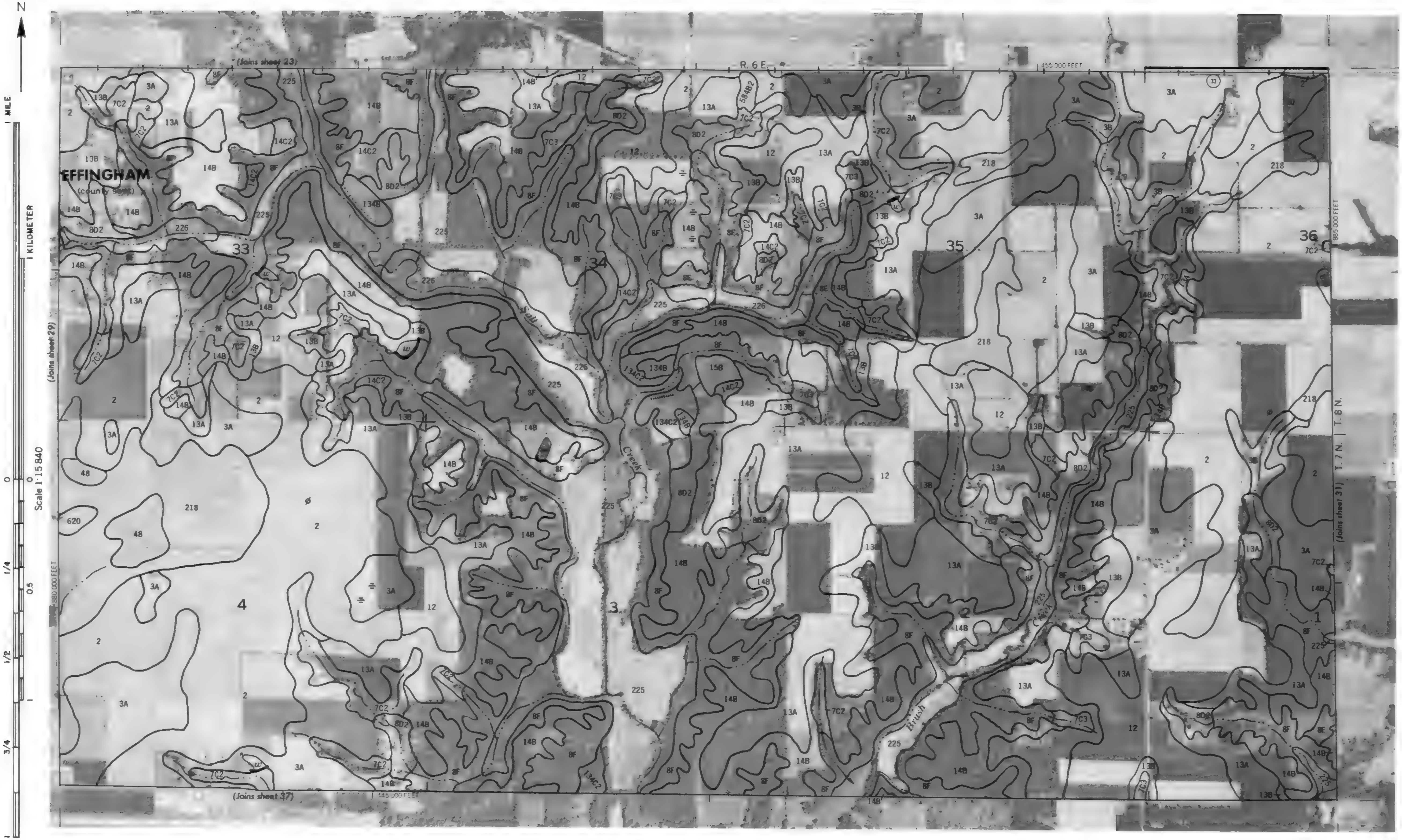
SOIL MAP OF EFFINGHAM COUNTY, ILLINOIS — SHEET NUMBER 30



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Coordinate grid ticks and land division corners, if shown, are approximately positioned.

EFFINGHAM COUNTY, ILLINOIS NO. 31

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Coordinate grid ticks and land division corners, if shown, are approximately positioned

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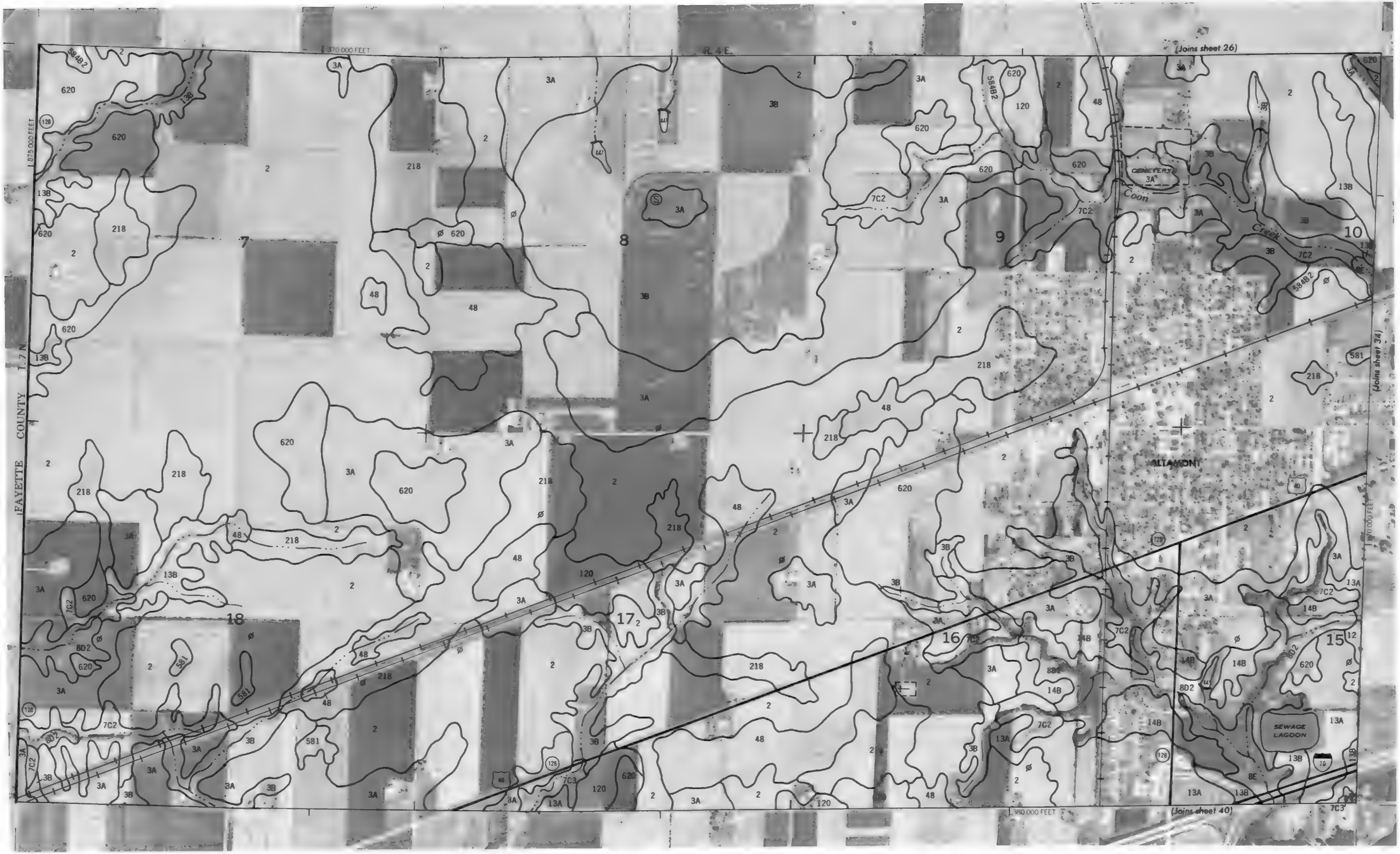
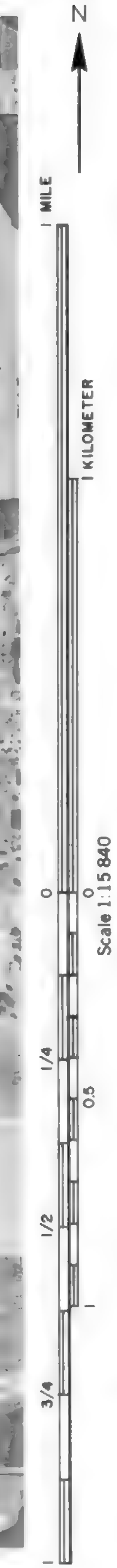
EFFINGHAM COUNTY, ILLINOIS NO. 33

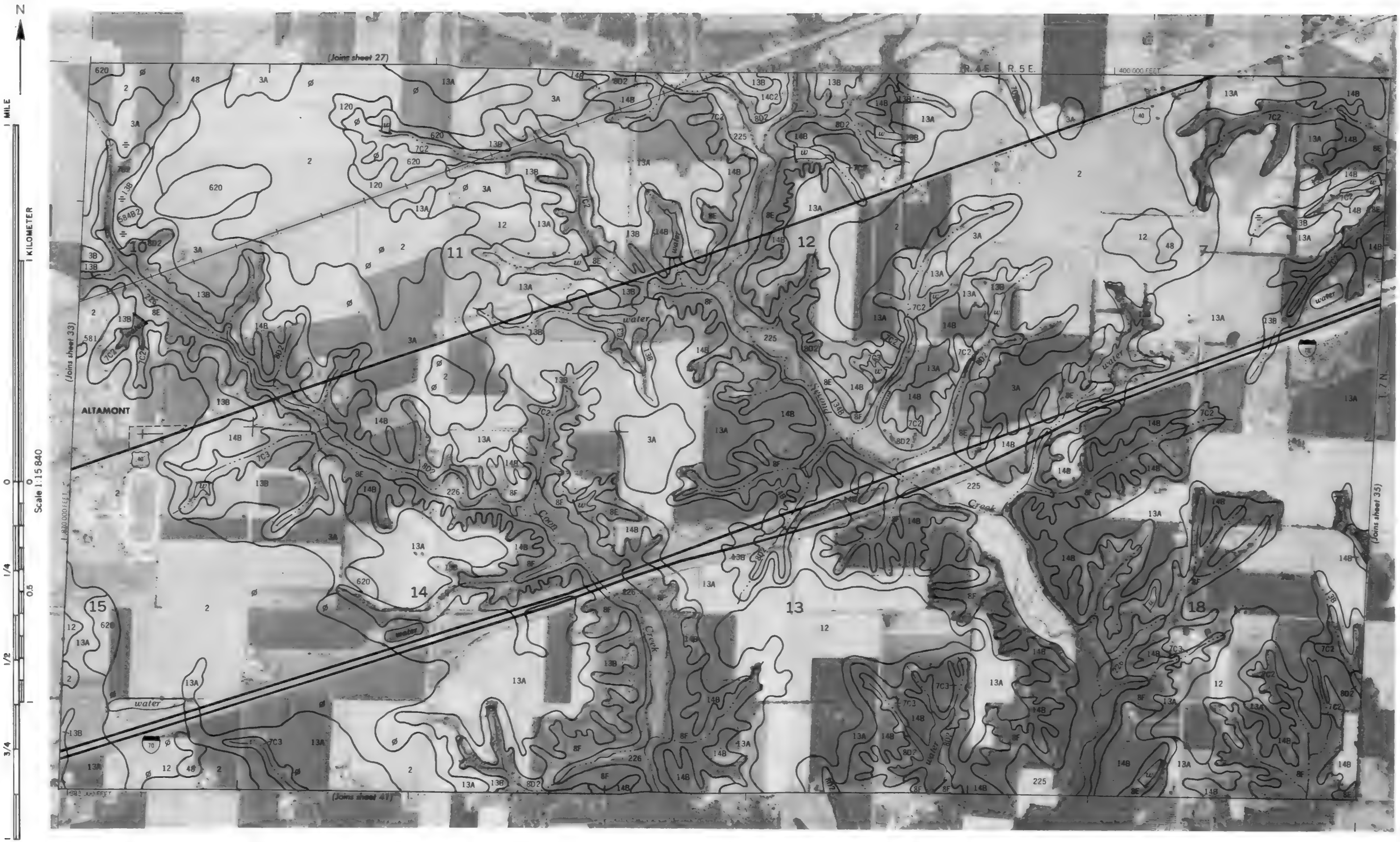
This soil survey map is compiled on 1981 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

Coordinate grid ticks and land division corners, if shown, are approximately positioned





SOIL MAP OF EFFINGHAM COUNTY, ILLINOIS — SHEET NUMBER 34



This soil survey map is compiled on 1981 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies
Coordinate grid ticks and land division corners, if shown, are approximately positioned

EFFINGHAM COUNTY, ILLINOIS NO. 34

EFFINGHAM COUNTY, ILLINOIS NO. 35

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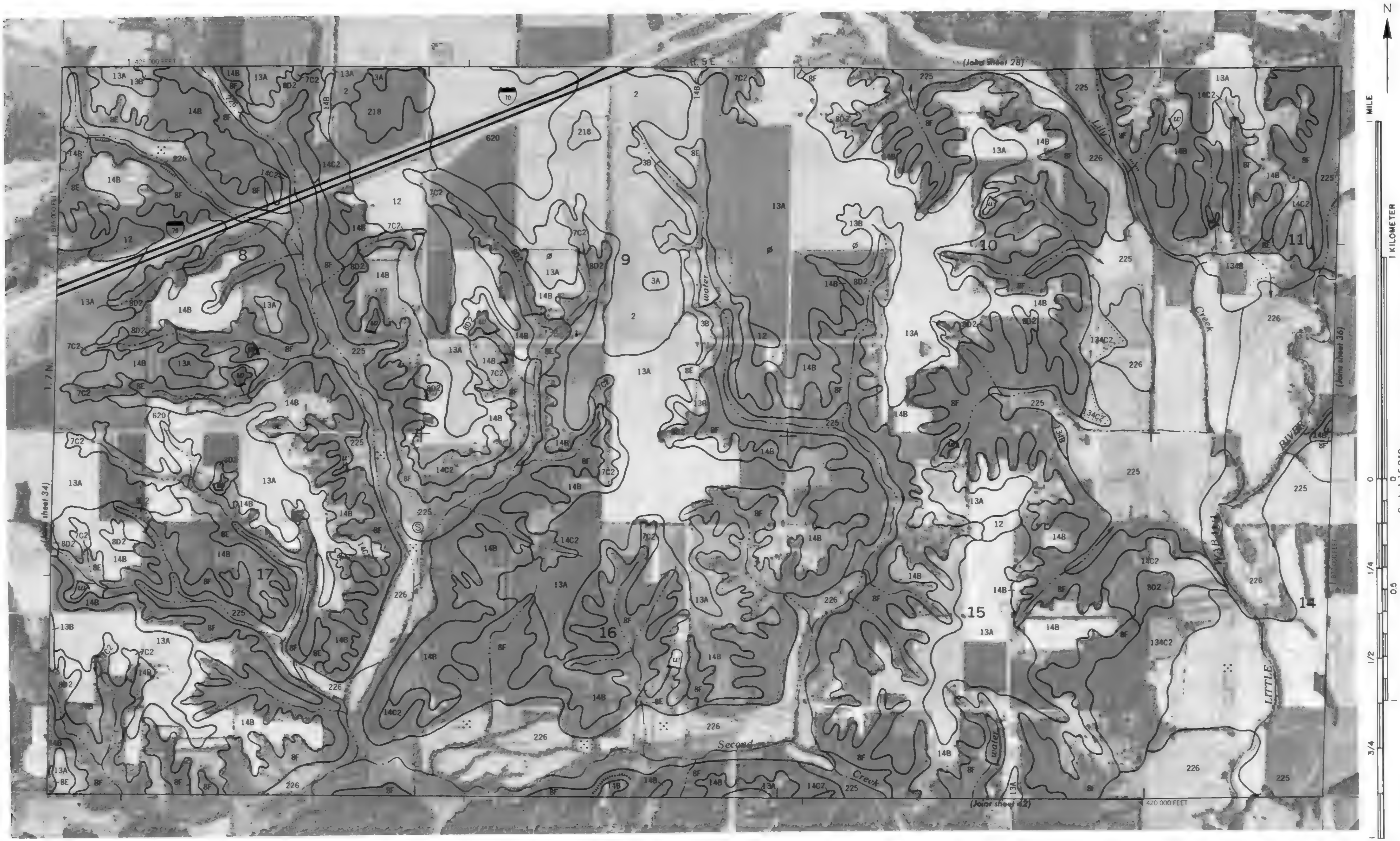
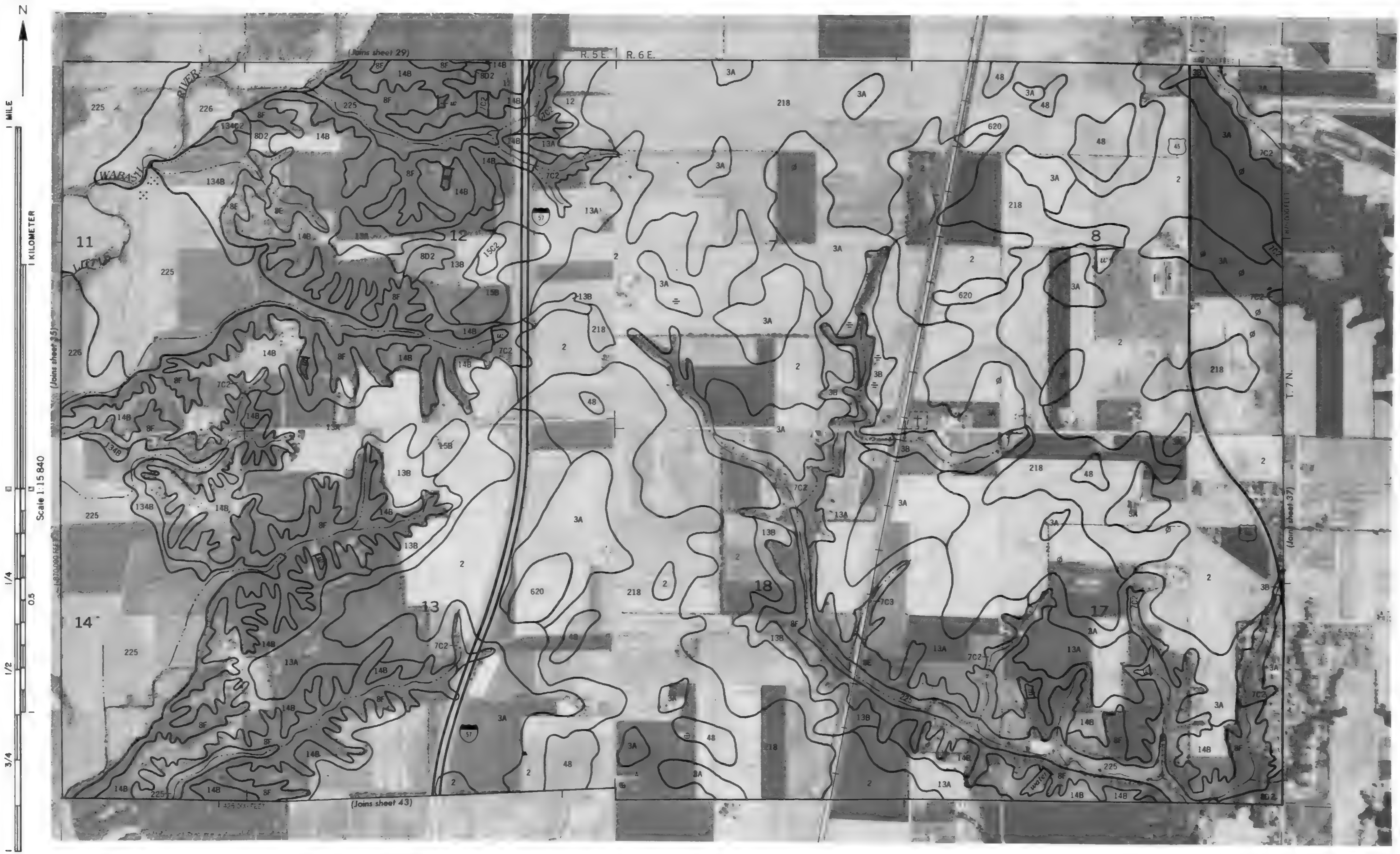


SOIL MAP OF EFFINGHAM COUNTY, ILLINOIS — SHEET NUMBER 36



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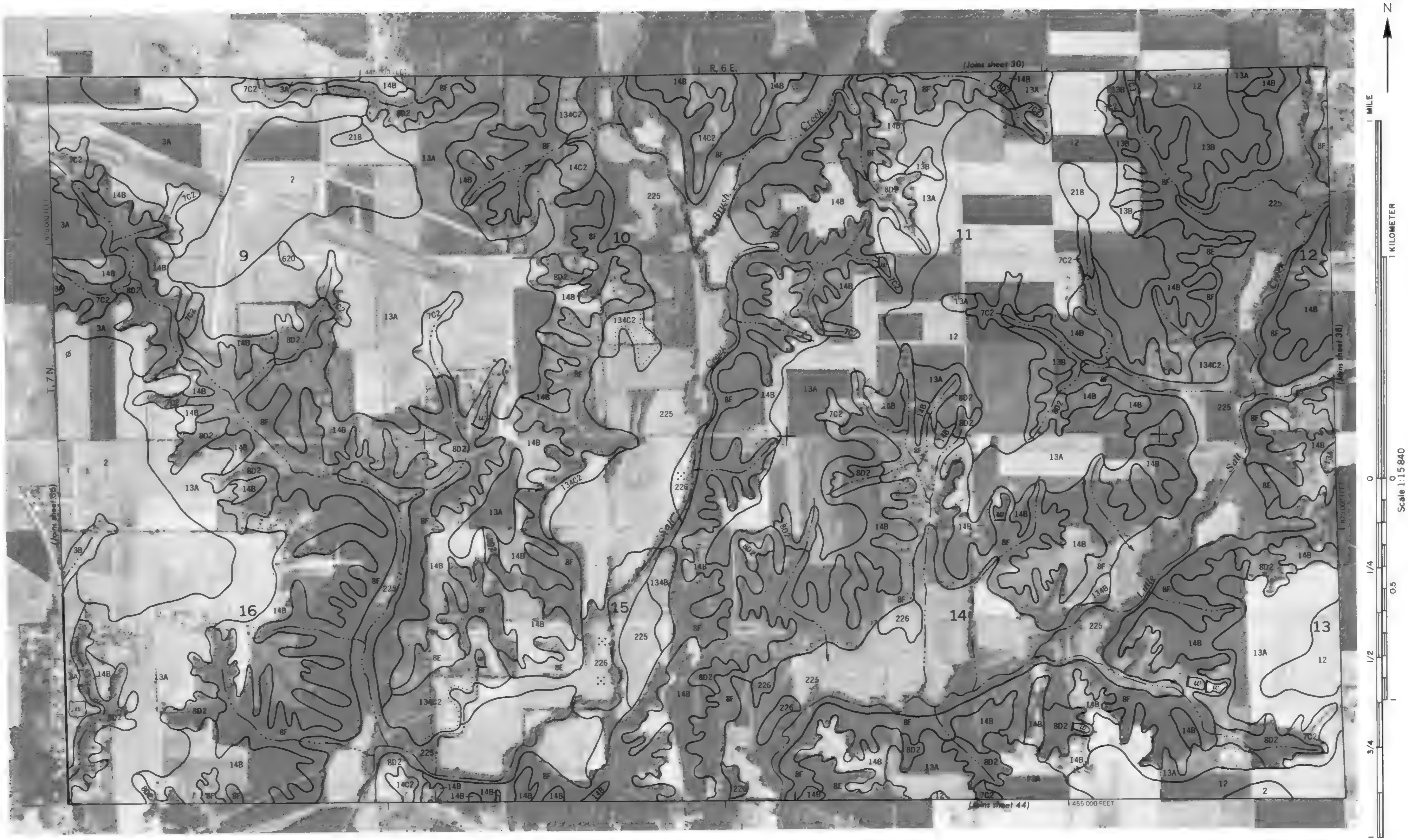
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

EFFINGHAM COUNTY, ILLINOIS NO. 36

EFFINGHAM COUNTY, ILLINOIS NO. 37

This soil survey map is compiled on 1981 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

Coordinate grid ticks and land division corners, if shown, are approximately positioned



SOIL MAP OF EFFINGHAM COUNTY, ILLINOIS — SHEET NUMBER 38

N

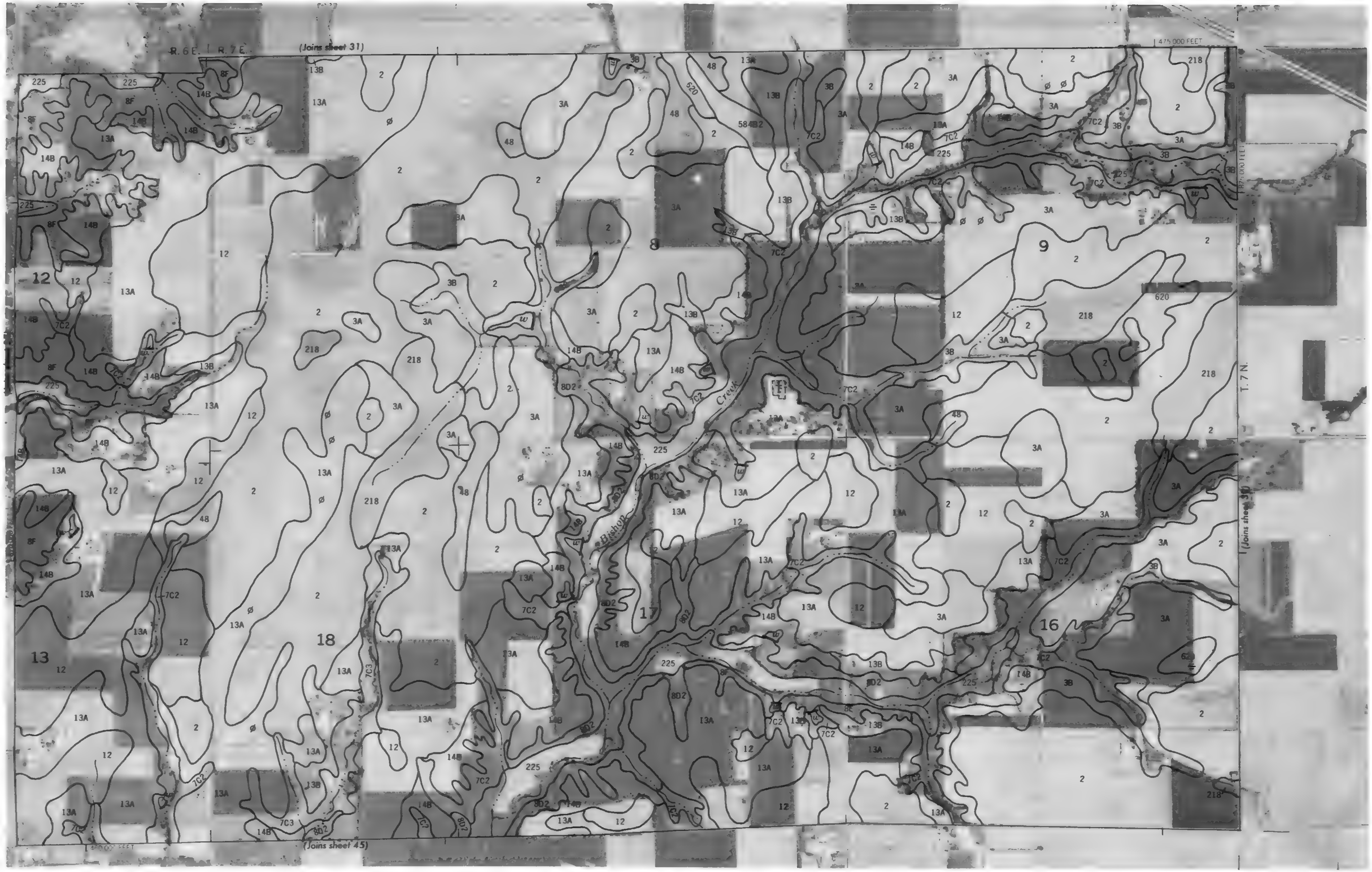
1 MILE

1 KILOMETER

Scale 1:15 840

0 1/4 1/2 3/4

0 0.5 1

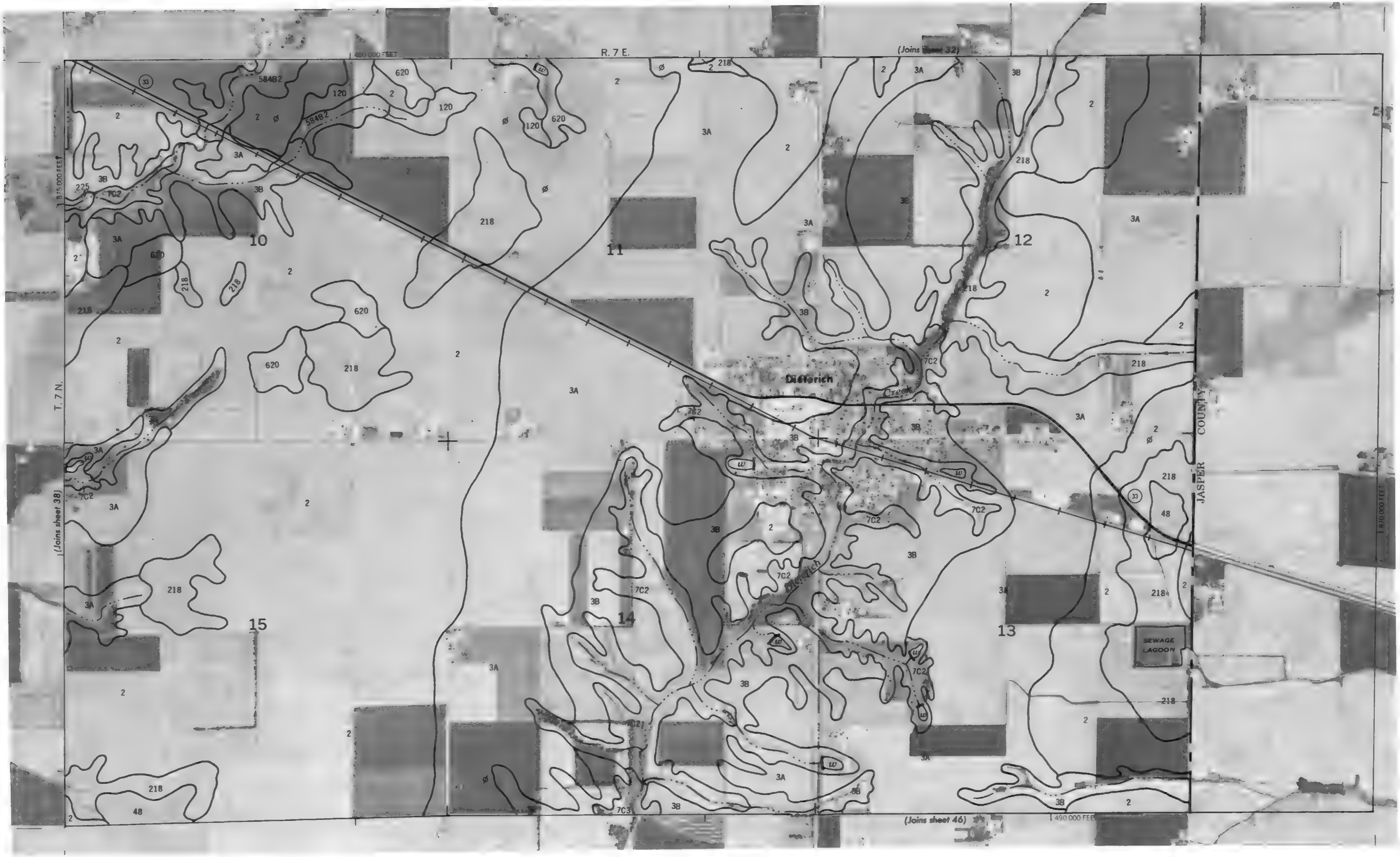


This soil survey map is compiled on 1981 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

EFFINGHAM COUNTY, ILLINOIS NO. 38

EFFINGHAM COUNTY, ILLINOIS NO. 39

This soil survey map is compiled on 1981 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies
Coordinate grid ticks and land division corners, if shown, are approximately positioned



N

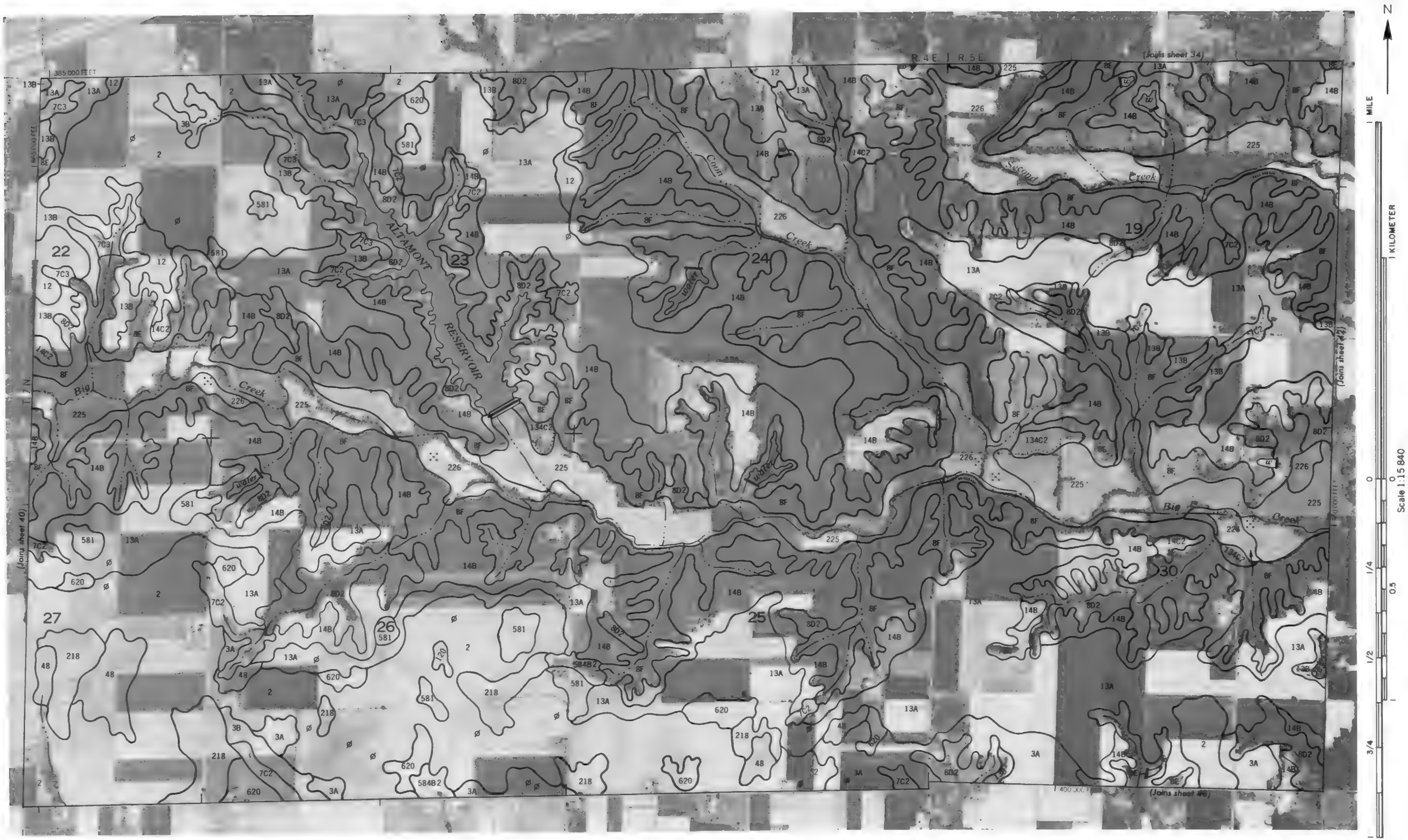
Scale 1:15 840

1 MILE
3/4
1/2
1/4
0

1 KILOMETER
0.5
0

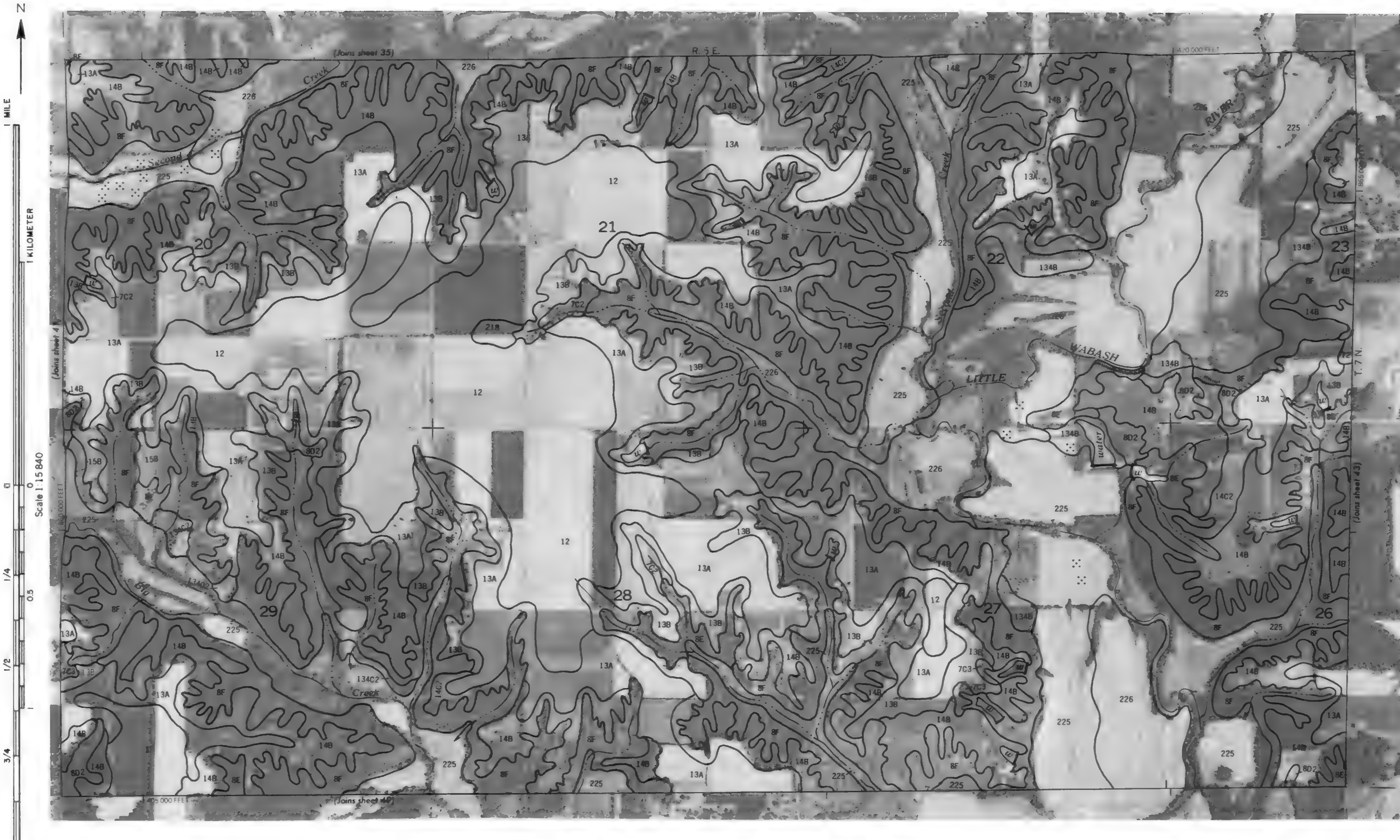
SOIL MAP OF EFFINGHAM COUNTY, ILLINOIS — SHEET NUMBER 40

This soil survey map is compiled on 1981 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



EFFINGHAM COUNTY, ILLINOIS NO. 41

This soil survey map is compiled on 1981 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies
Coordinate grid ticks and land division corners, if shown, are approximately positioned



This soil survey map is compiled on 1981 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF EFFINGHAM COUNTY, ILLINOIS — SHEET NUMBER 43

EFFINGHAM COUNTY, ILLINOIS NO. 43

This soil survey map is compiled on 1981 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF EFFINGHAM COUNTY, ILLINOIS — SHEET NUMBER 44

N

1 MILE

1 KILOMETER

Scale 1:15 840

0

1/4

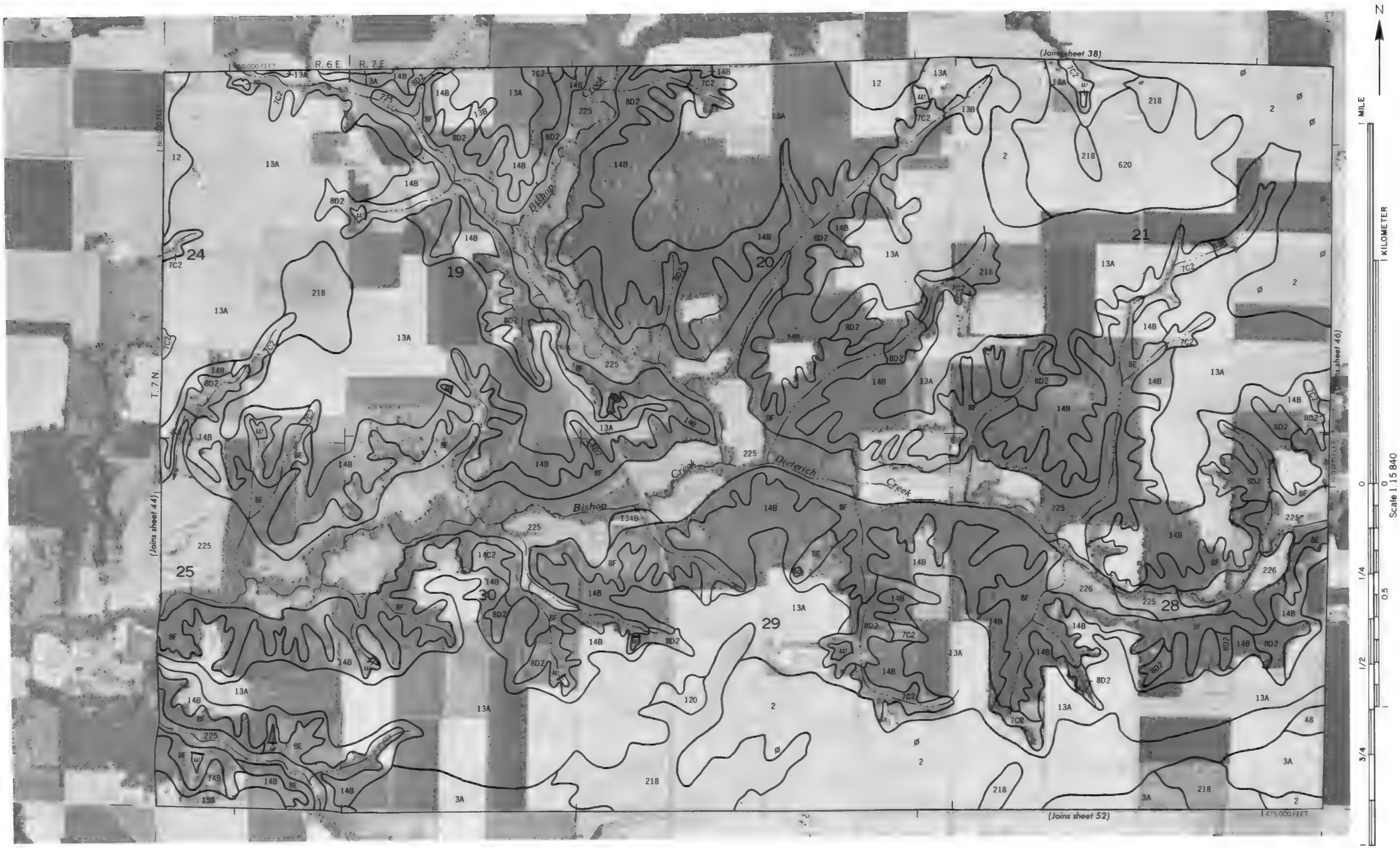
0.5

1/2

3/4

This soil survey map is compiled on 1981 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

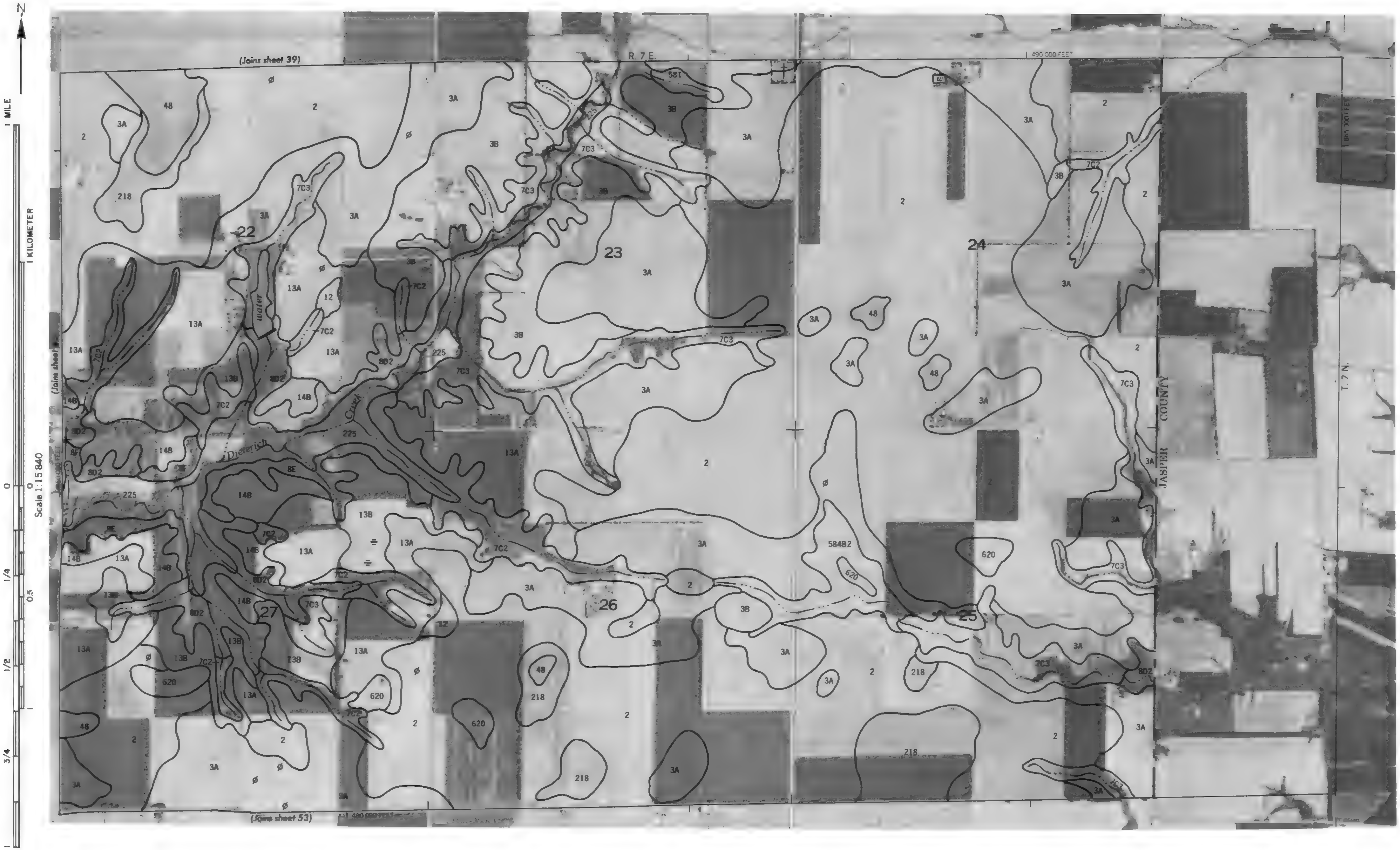
EFFINGHAM COUNTY, ILLINOIS NO. 44



EFFINGHAM COUNTY, ILLINOIS NO. 45

This soil survey map is compiled on 1981 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF EFFINGHAM COUNTY, ILLINOIS — SHEET NUMBER 46



This soil survey map is compiled on 1981 aerial photography by the U.S. Department of Agriculture Soil Conservation Service and cooperating agencies
Coordinate grid ticks and land division corners, if shown, are approximately positioned

EFFINGHAM COUNTY, ILLINOIS NO. 46

47

N

1 MILE

1 KILOMETER

0 1/4 1/2 3/4

0 0.5

Scale 1:15 840

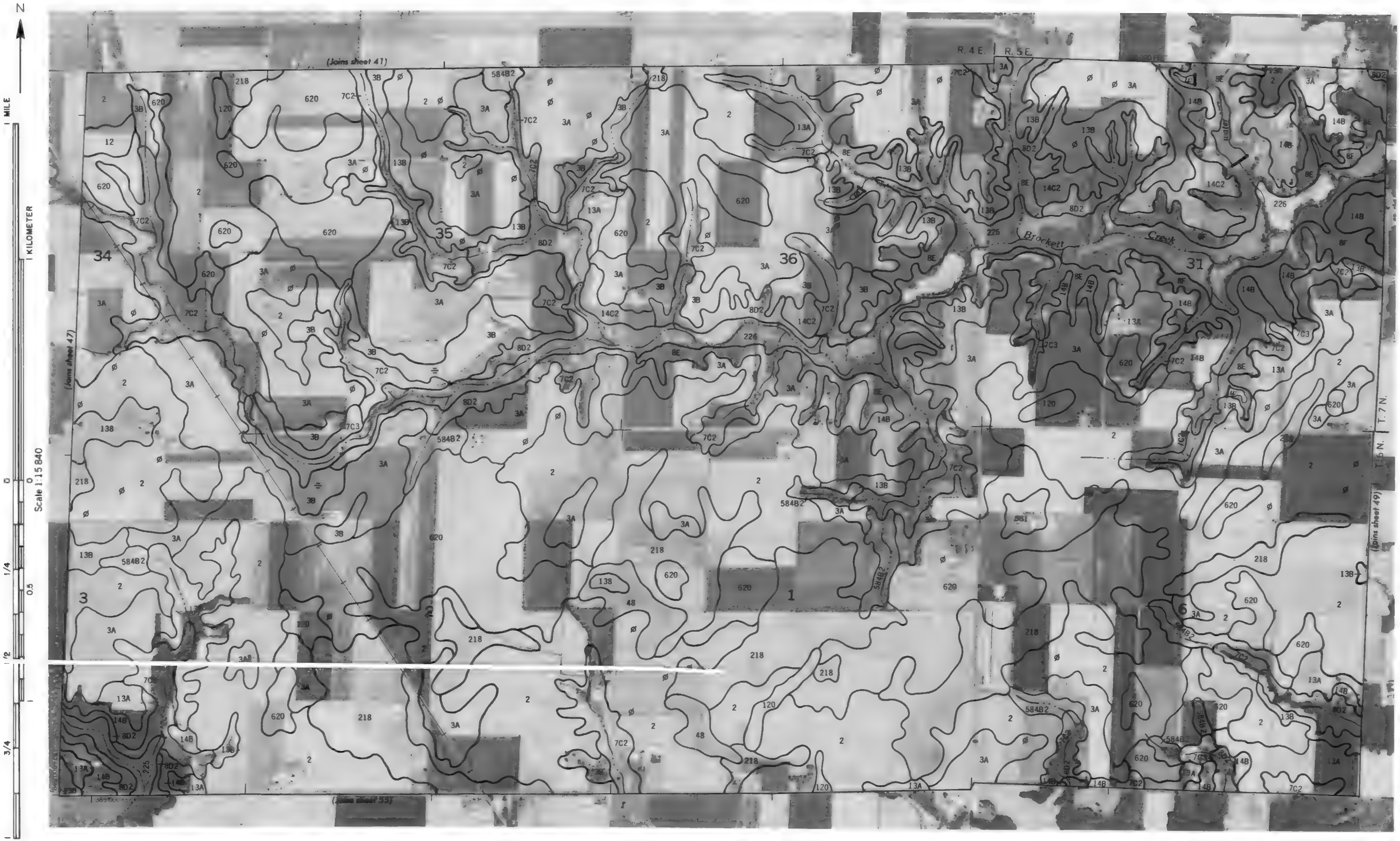
EFFINGHAM COUNTY, ILLINOIS NO. 47

This soil survey map is compiled on 1981 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

Coordinate grid ticks and land division corners, if shown, are approximately positioned

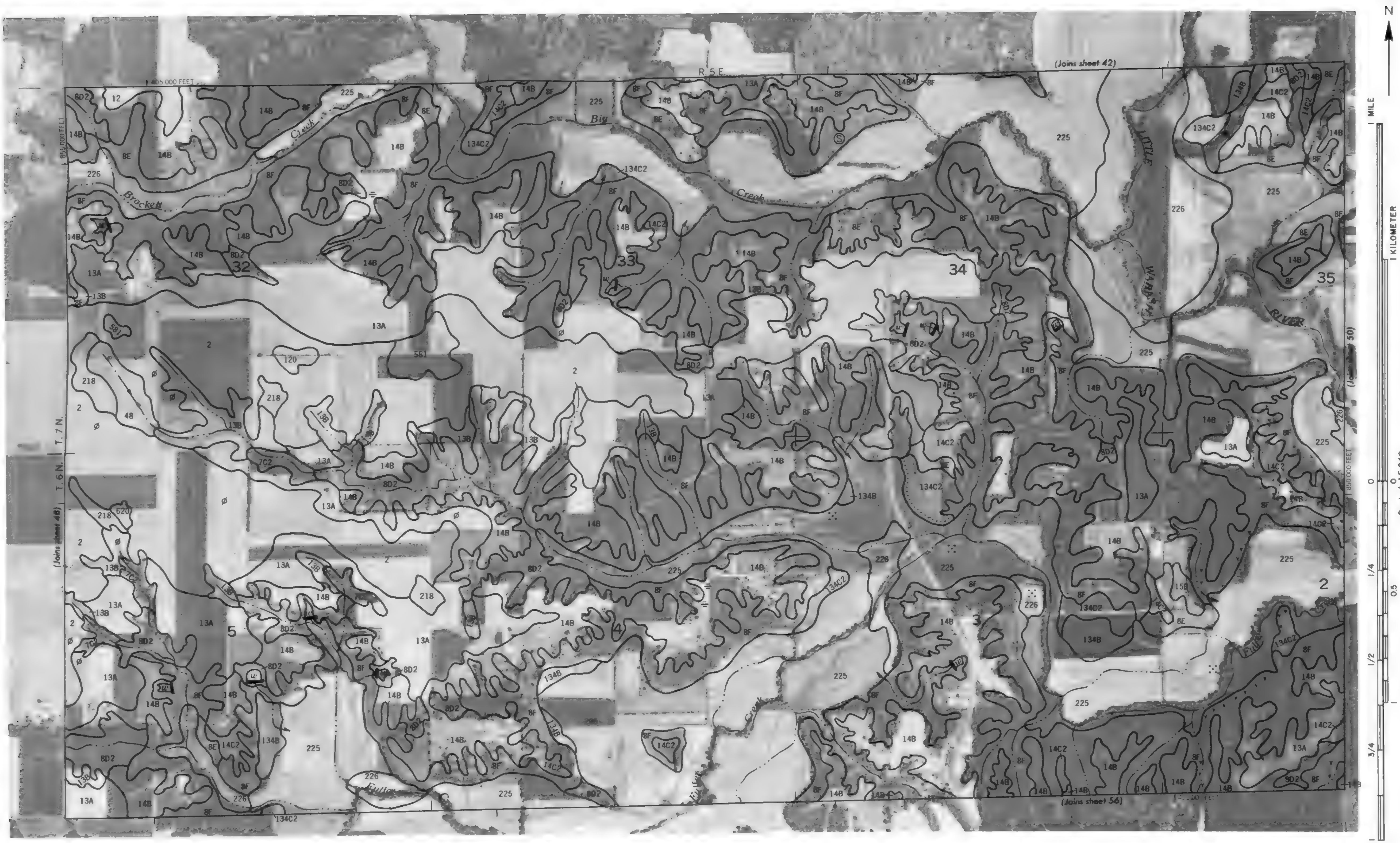
48

SOIL MAP OF EFFINGHAM COUNTY, ILLINOIS — SHEET NUMBER 48



This soil survey map is compiled on 1981 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

EFFINGHAM COUNTY, ILLINOIS NO. 48



EFFINGHAM COUNTY, ILLINOIS NO. 49

This soil survey map is compiled on 1981 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned

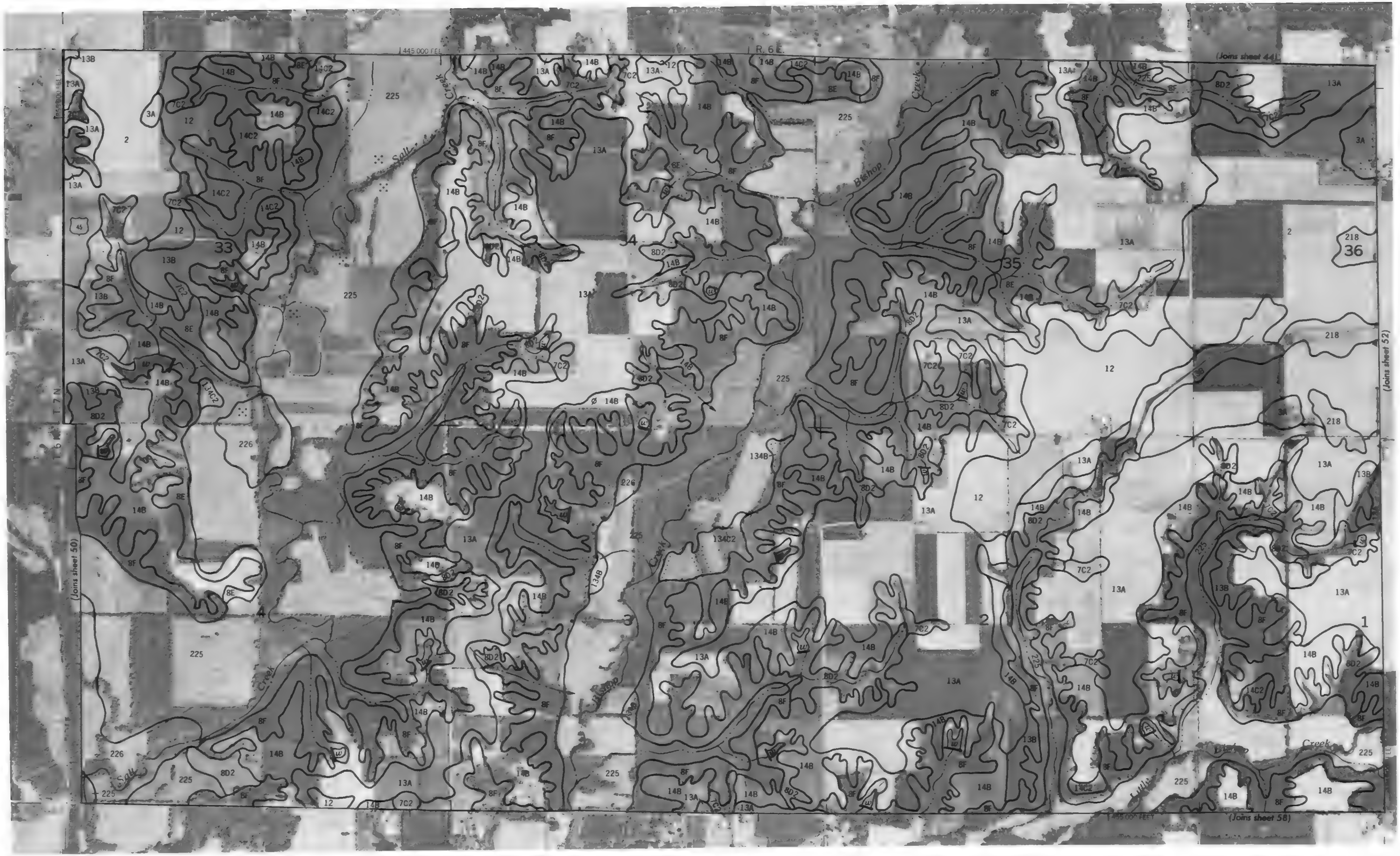
SOIL MAP OF EFFINGHAM COUNTY, ILLINOIS — SHEET NUMBER 50

This soil survey map is compiled on 1981 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies
Coordinate grid ticks and land division corners, if shown, are approximately positioned

EFFINGHAM COUNTY, ILLINOIS NO. 50

EFFINGHAM COUNTY, ILLINOIS NO. 51

This soil survey map is compiled on 1981 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



N

1 MILE

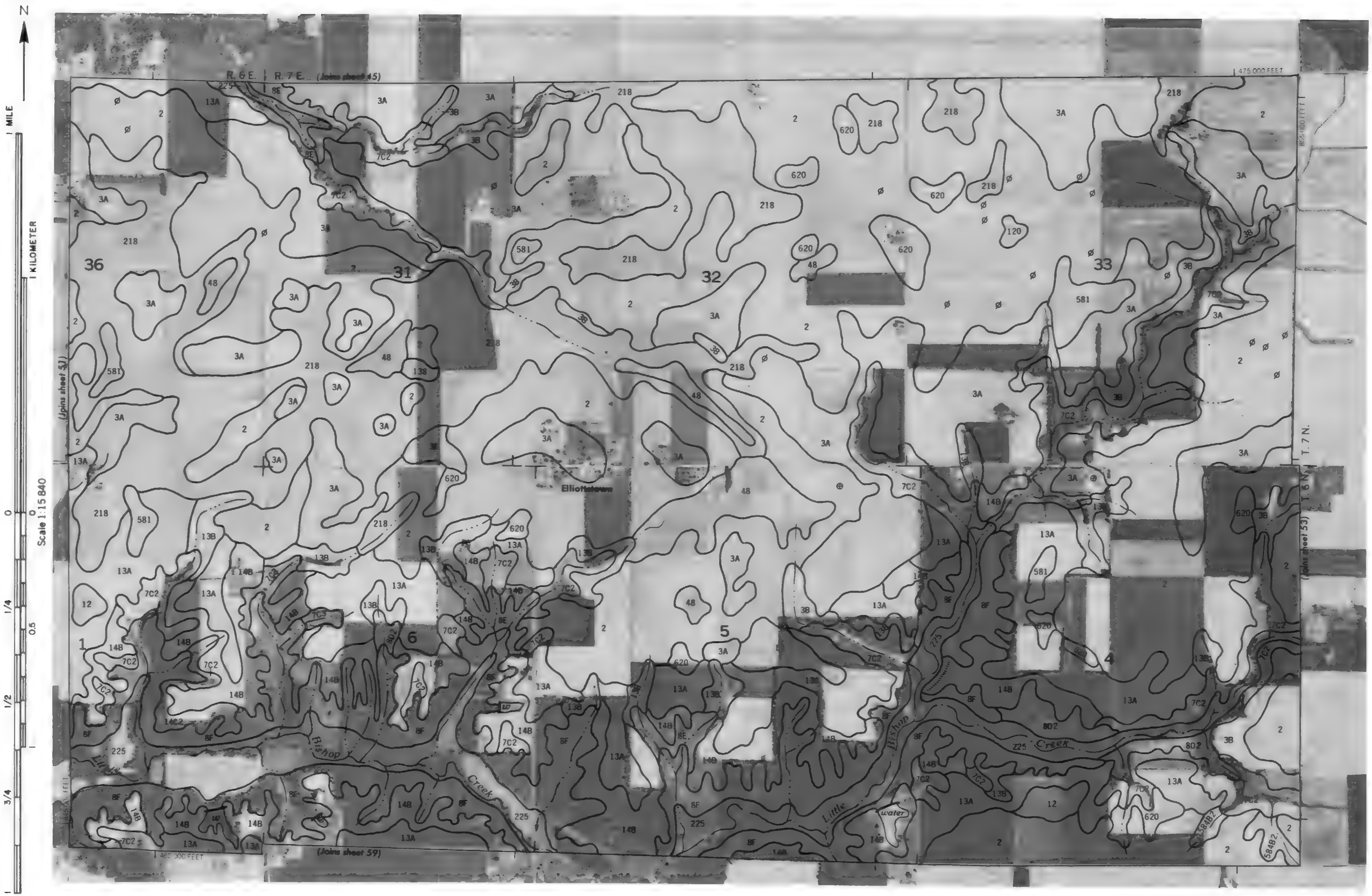
1 KILOMETER

0 1/4 1/2 3/4

0 0.5

Scale 1:15 840

SOIL MAP OF EFFINGHAM COUNTY, ILLINOIS — SHEET NUMBER 52



This soil survey map is compiled on 1981 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies
Coordinate grid ticks and land division corners, if shown, are approximately positioned

EFFINGHAM COUNTY, ILLINOIS NO. 52

EFFINGHAM COUNTY, ILLINOIS NO. 53

This soil survey map is compiled on 1981 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

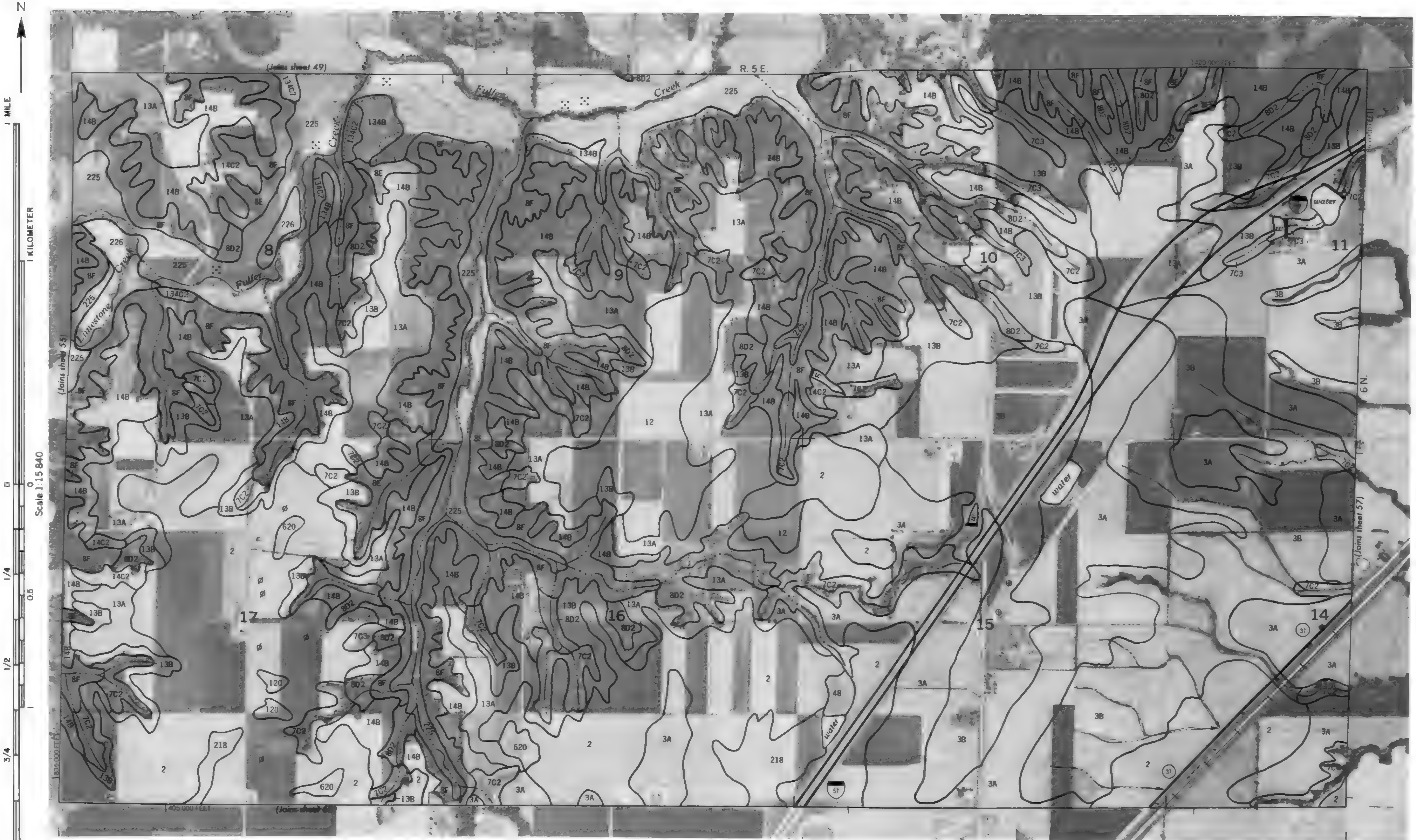
SOIL MAP OF EFFINGHAM COUNTY, ILLINOIS — SHEET NUMBER 54

This soil survey map is compiled on 1981 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

EFFINGHAM COUNTY, ILLINOIS NO. 55

This soil survey map is compiled on 1981 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF EFFINGHAM COUNTY, ILLINOIS — SHEET NUMBER 56

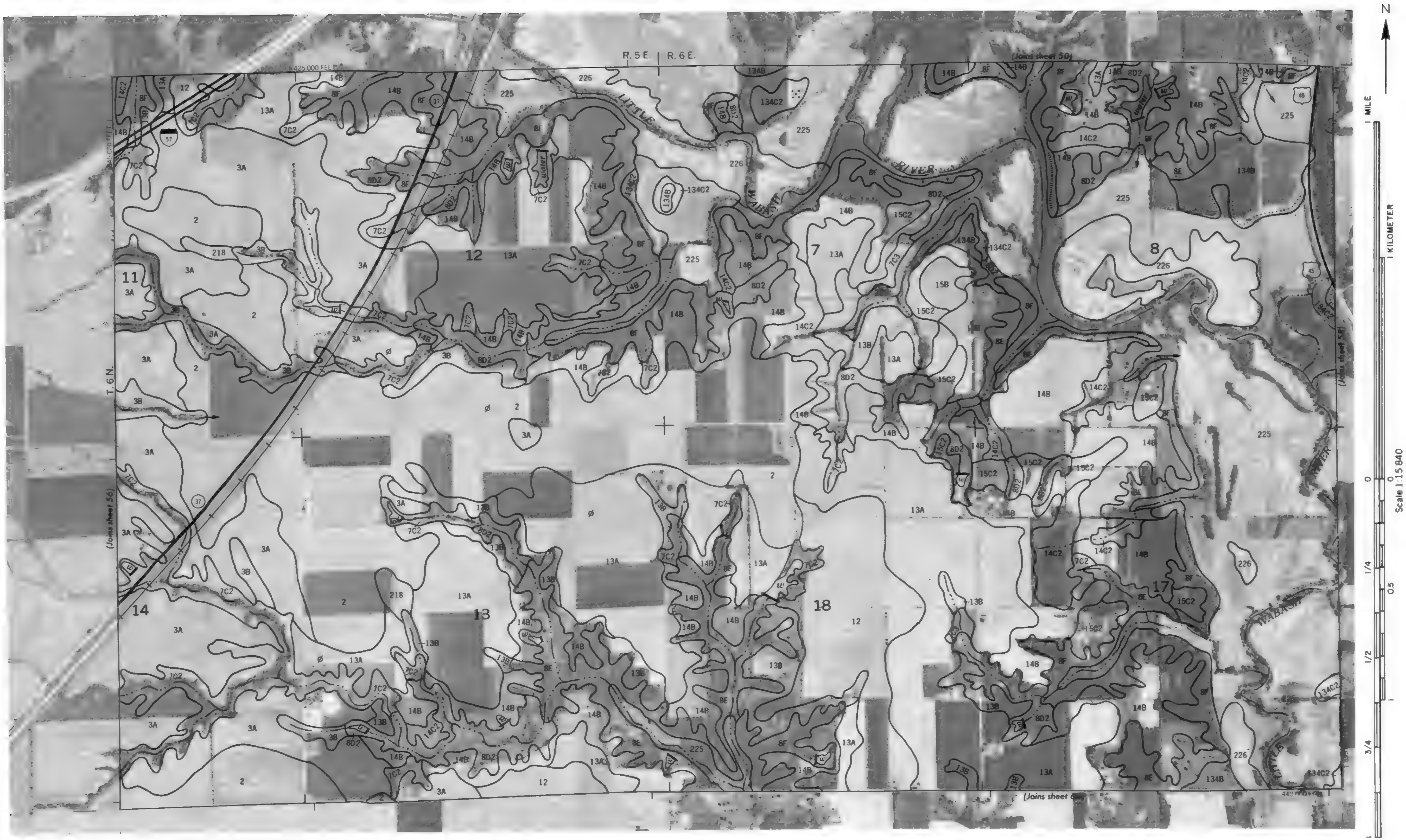


This soil survey map is compiled on 1981 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies
Coordinate grid ticks and land division corners, if shown, are approximately positioned

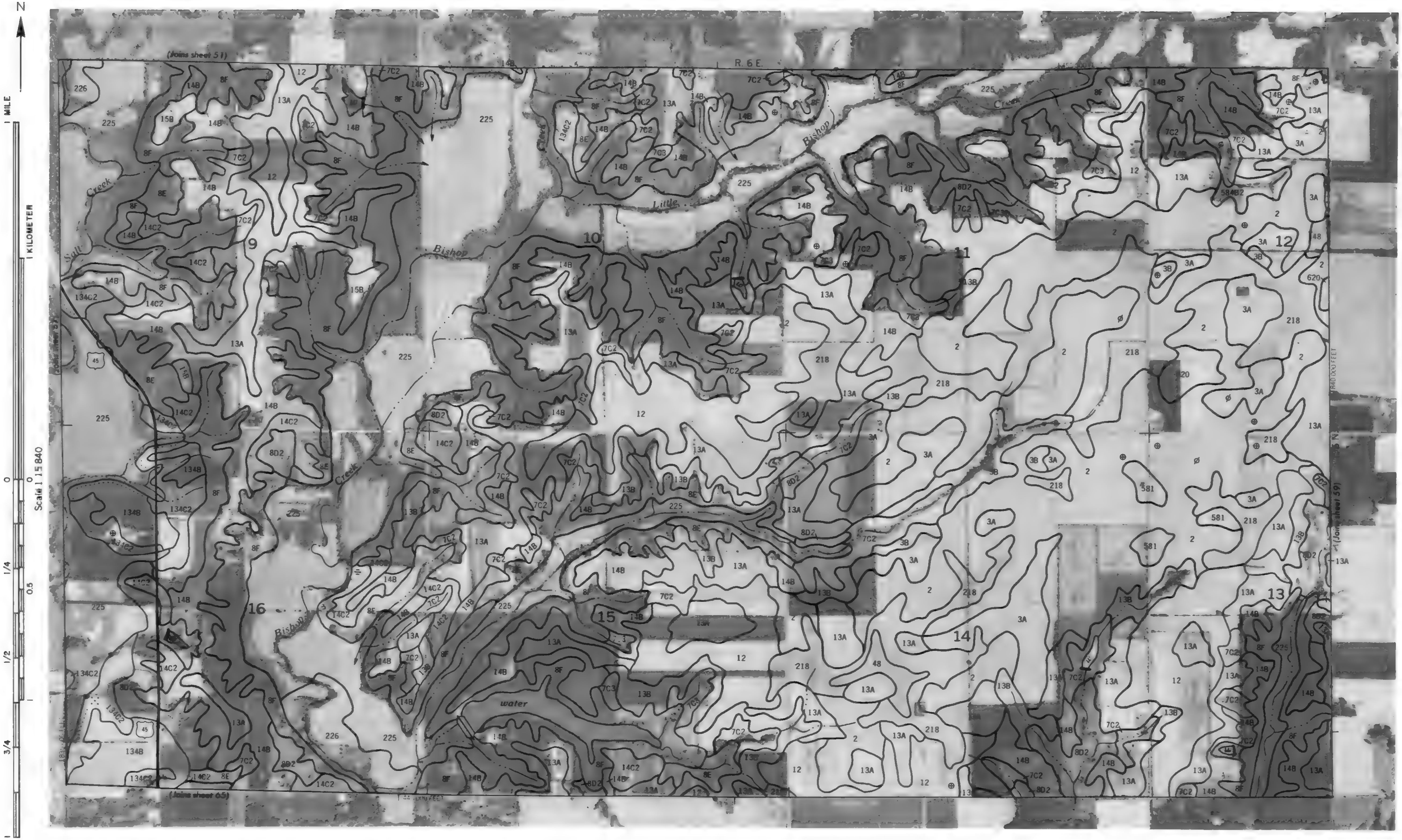
EFFINGHAM COUNTY, ILLINOIS NO. 56

EFFINGHAM COUNTY, ILLINOIS NO. 57

This soil survey map is compiled on 1981 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies
Coordinate grid ticks and land division corners, if shown, are approximately positioned



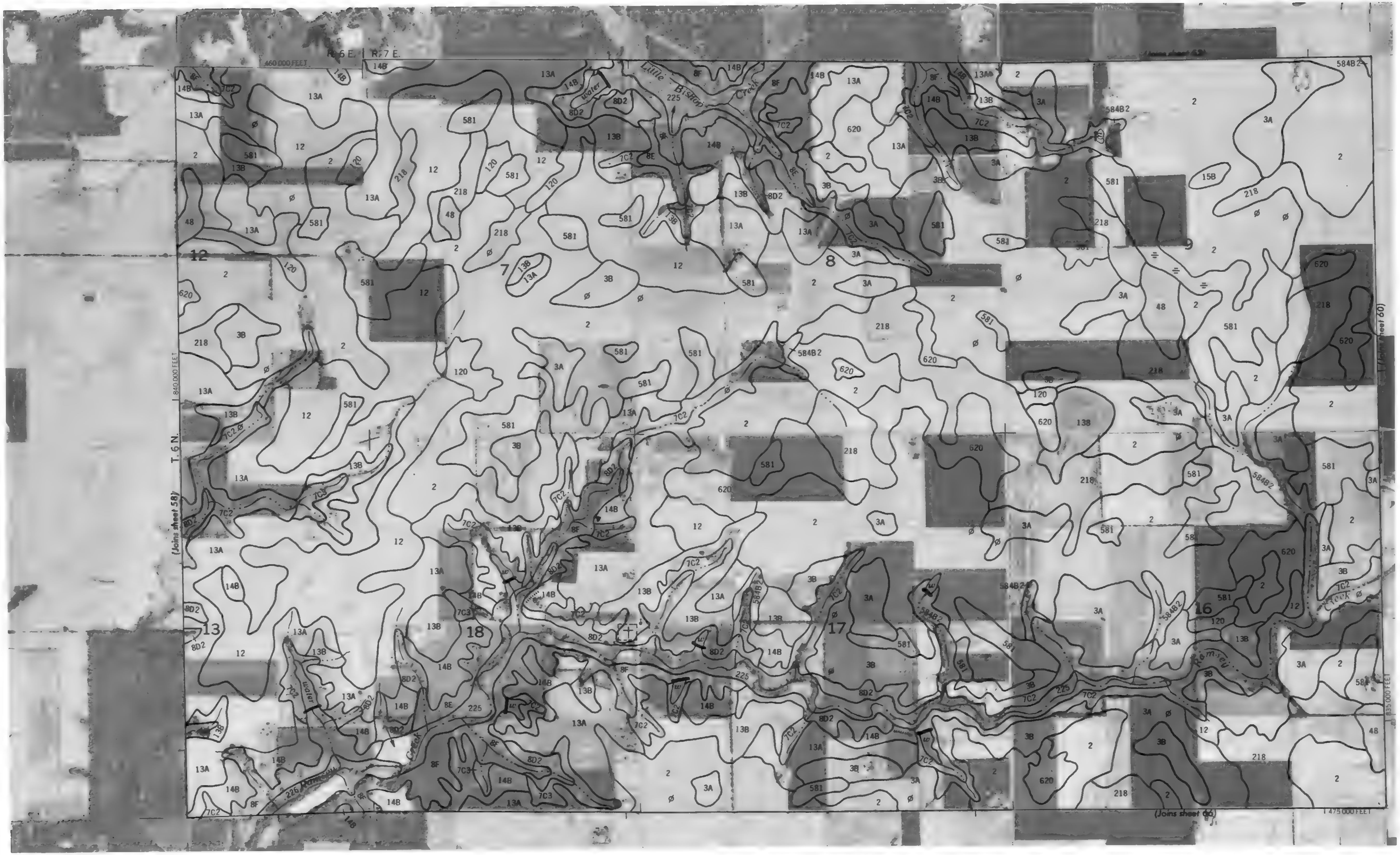
SOIL MAP OF EFFINGHAM COUNTY, ILLINOIS — SHEET NUMBER 58



This soil survey map is compiled on 1981 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

EFFINGHAM COUNTY, ILLINOIS NO. 59

This soil survey map is compiled on 1981 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies
Coordinate grid ticks and land division corners, if shown, are approximately positioned



N

1 MILE

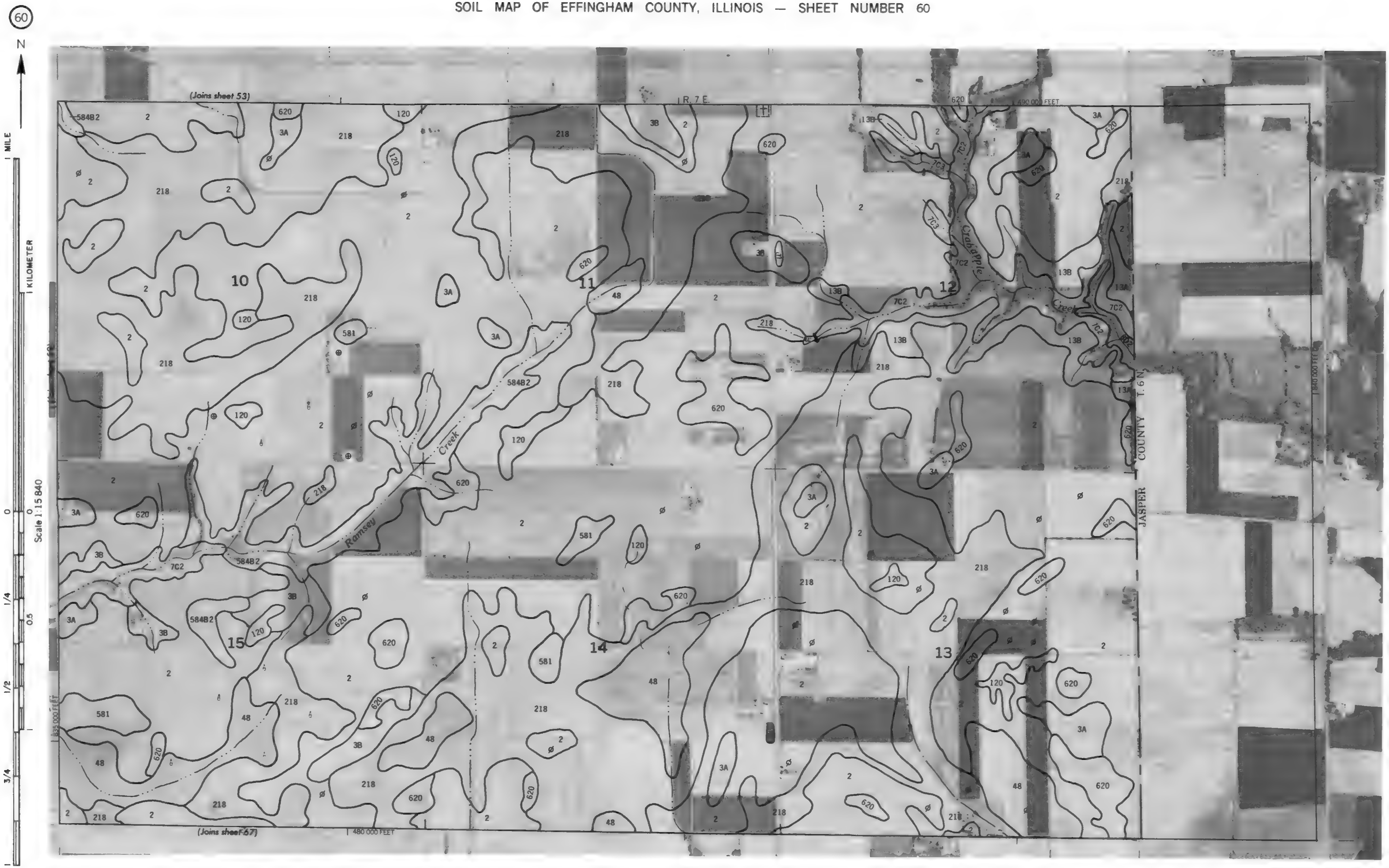
1 KILOMETER

0
1/4
1/2
3/4

0
0.5

Scale 1:15 840

SOIL MAP OF EFFINGHAM COUNTY, ILLINOIS — SHEET NUMBER 60



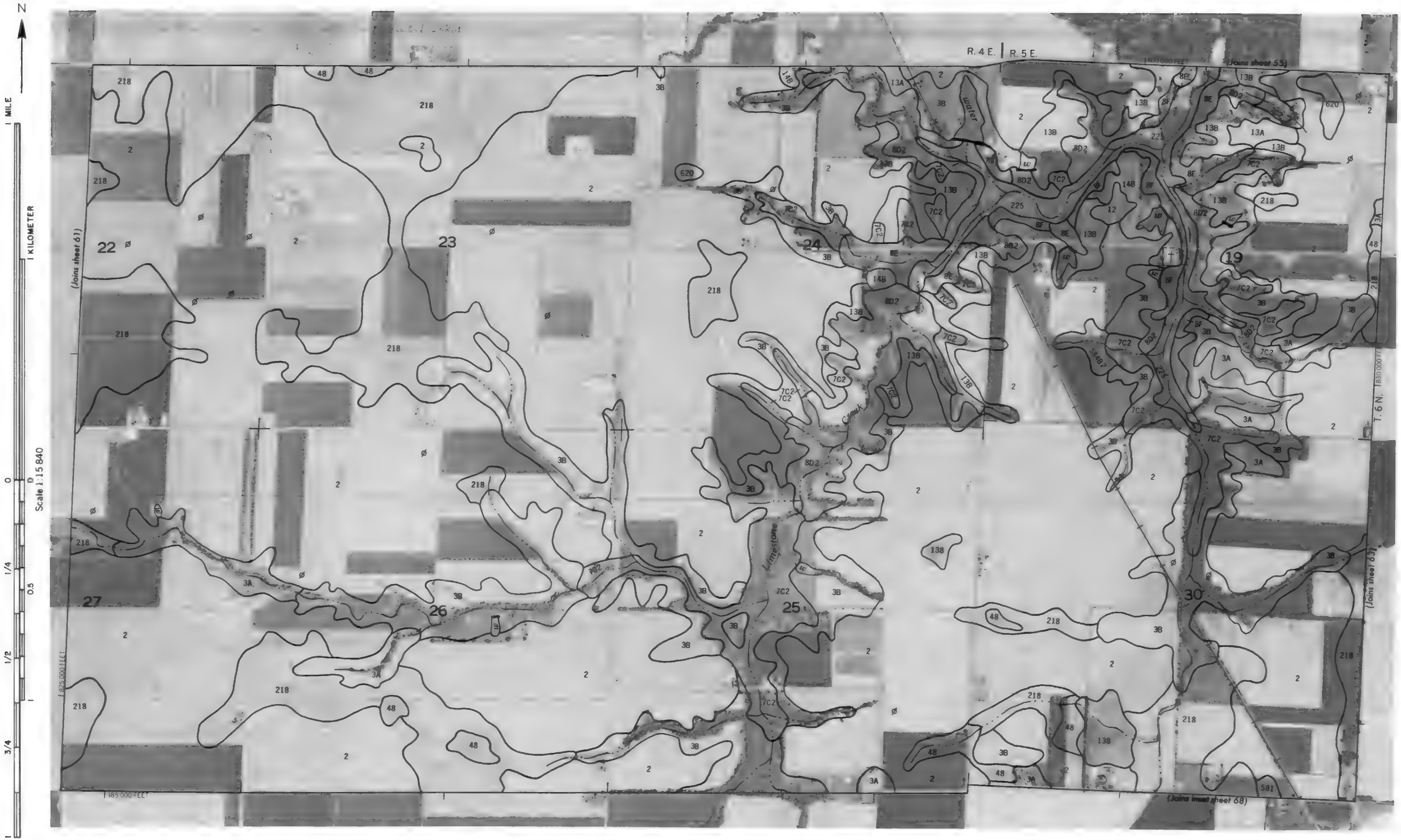
This soil survey map is compiled on 1981 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned

EFFINGHAM COUNTY, ILLINOIS NO. 60

EFFINGHAM COUNTY, ILLINOIS NO. 61

This soil survey map is compiled on 1981 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF EFFINGHAM COUNTY, ILLINOIS — SHEET NUMBER 62



This soil survey map is compiled on 1981 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

EFFINGHAM COUNTY, ILLINOIS NO. 63

This soil survey map is compiled on 1981 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned

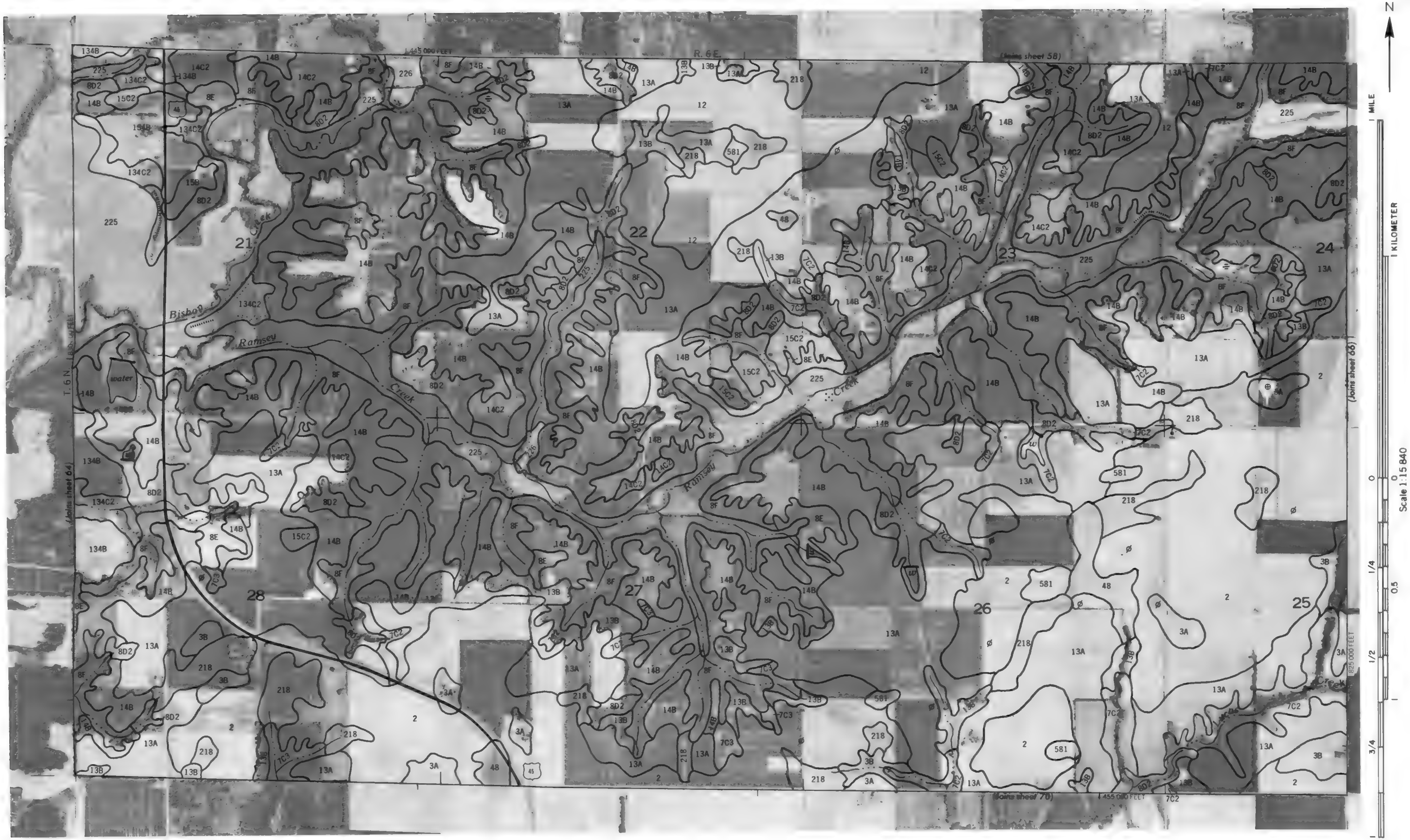
SOIL MAP OF EFFINGHAM COUNTY, ILLINOIS — SHEET NUMBER 64

This soil survey map is compiled on 1981 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

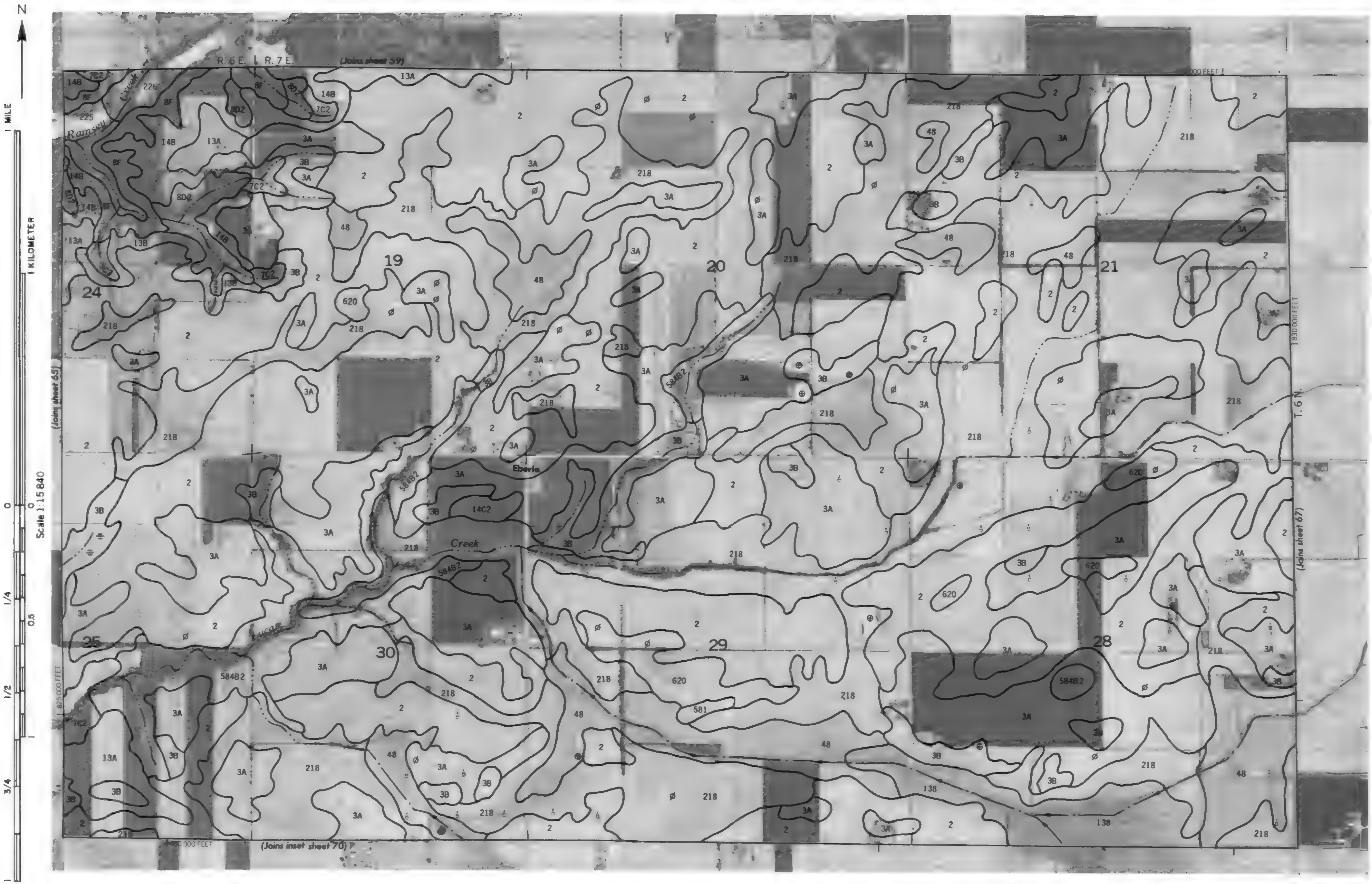
EFFINGHAM COUNTY, ILLINOIS NO. 64

EFFINGHAM COUNTY, ILLINOIS NO. 65

This soil survey map is compiled on 1981 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned

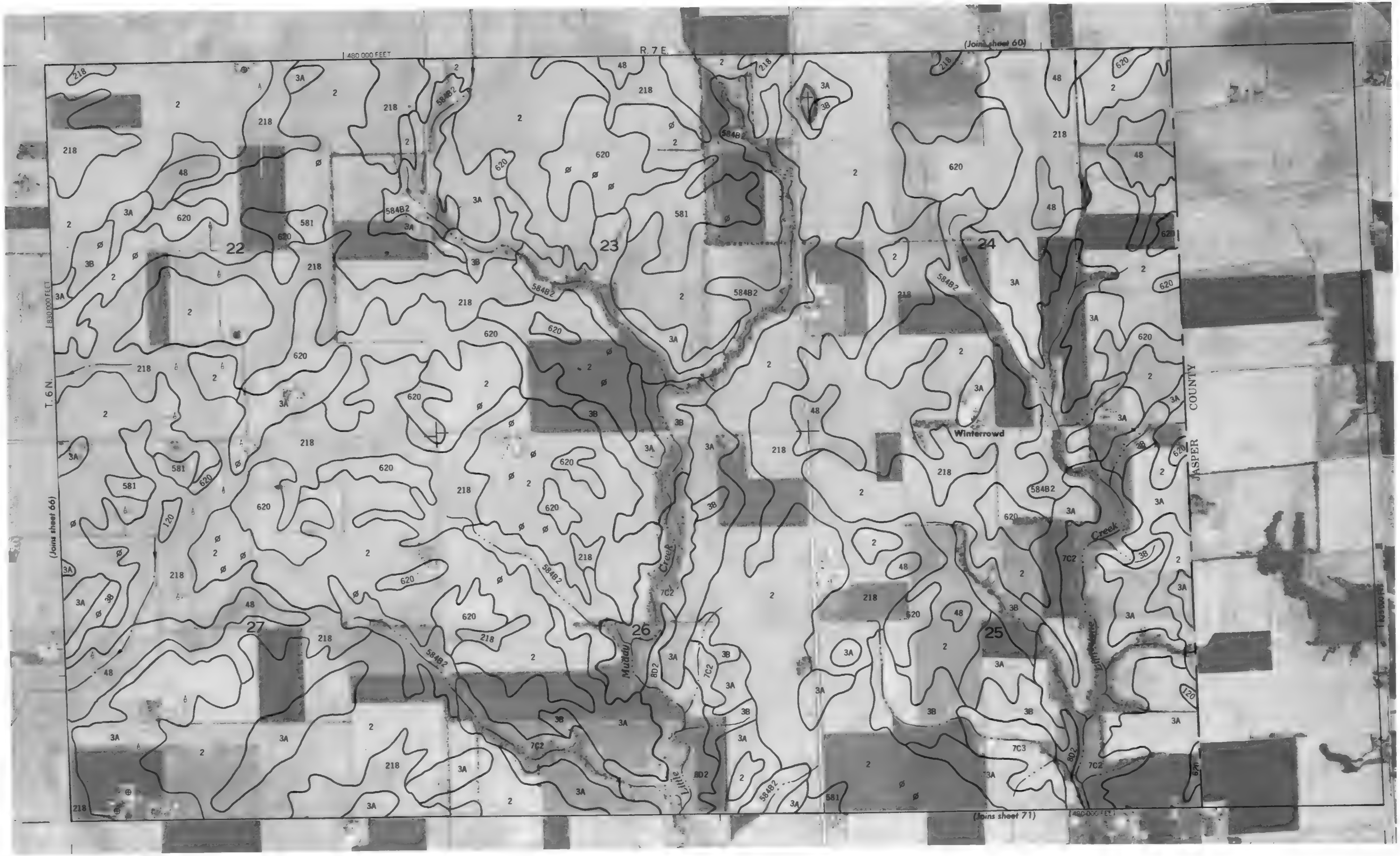


SOIL MAP OF EFFINGHAM COUNTY, ILLINOIS — SHEET NUMBER 66



This soil survey map is compiled on 1981 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

EFFINGHAM COUNTY, ILLINOIS NO. 66



N

1 MILE

1 KILOMETER

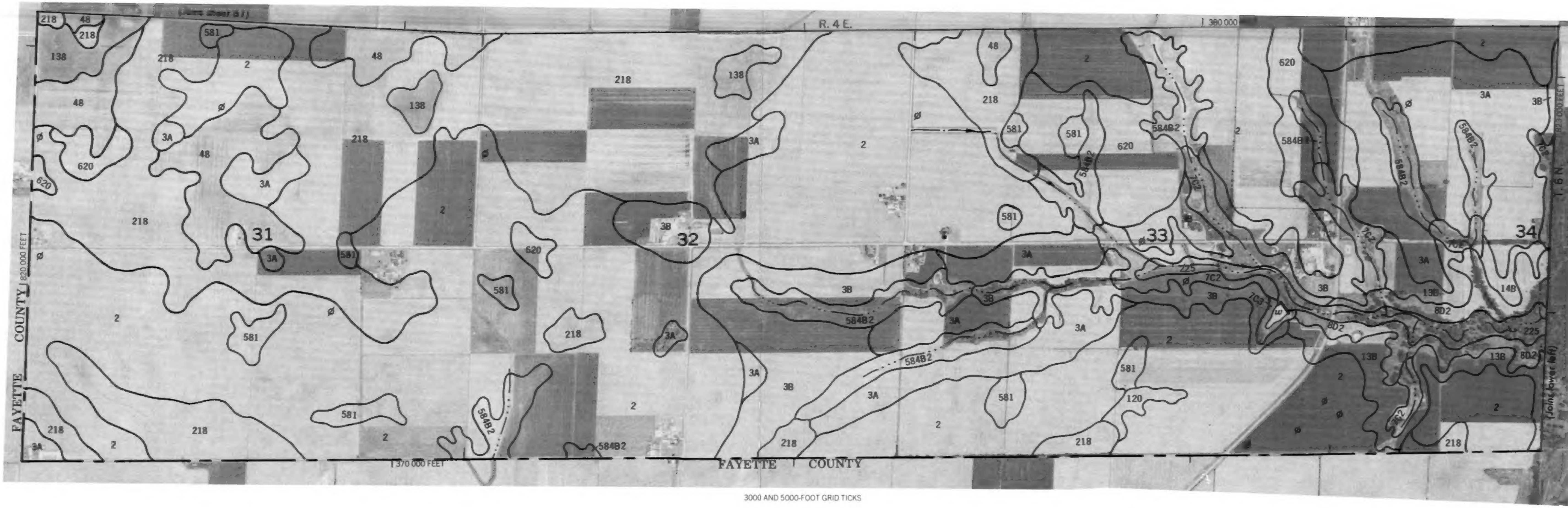
Scale 1:15 840

EFFINGHAM COUNTY, ILLINOIS NO. 67

This soil survey map is compiled on 1981 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

Coordinate grid ticks and land division corners, if shown, are approximately positioned

SOIL MAP OF EFFINGHAM COUNTY, ILLINOIS — SHEET NUMBER 68



3000 AND 5000-FOOT GRID TICKS

3000 AND 5000-FOOT GRID TICKS

N

1 MILE

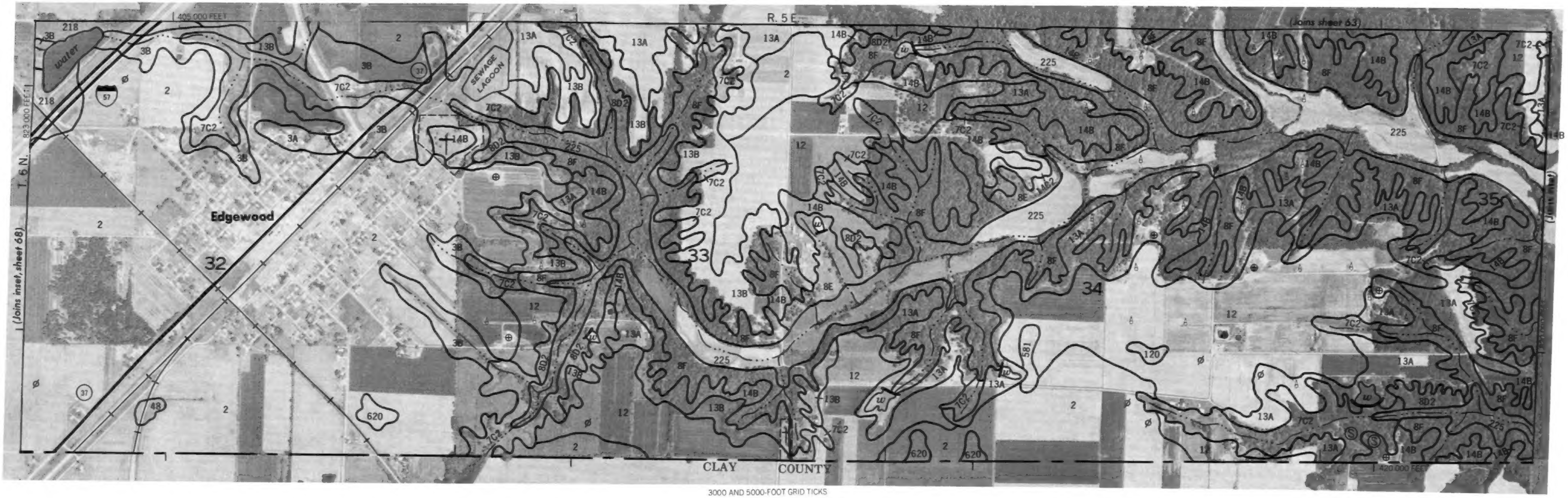
1 KILOMETER

Scale 1:15 840

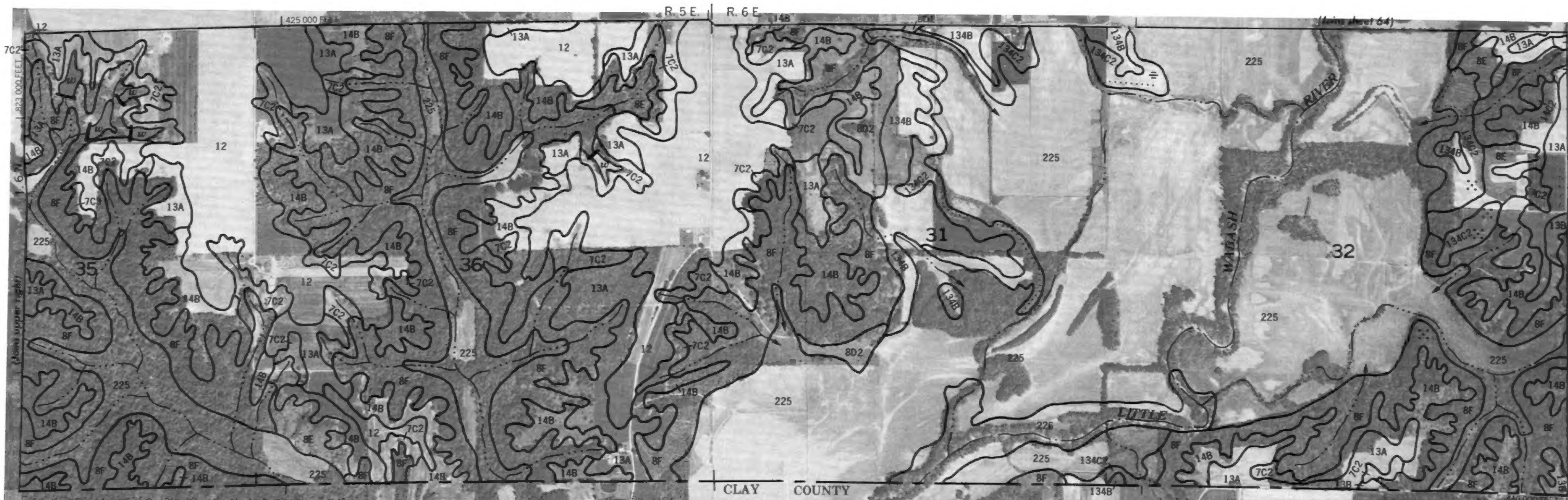
This soil survey map is compiled on 1981 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

EFFINGHAM COUNTY, ILLINOIS NO. 69

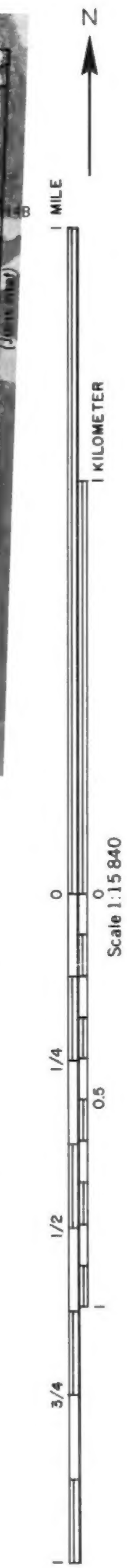
This soil survey map is compiled on 1981 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



3000 AND 5000-FOOT GRID TICKS



3000 AND 5000-FOOT GRID TICKS



(70)

SOIL MAP OF EFFINGHAM COUNTY, ILLINOIS — SHEET NUMBER 70

N

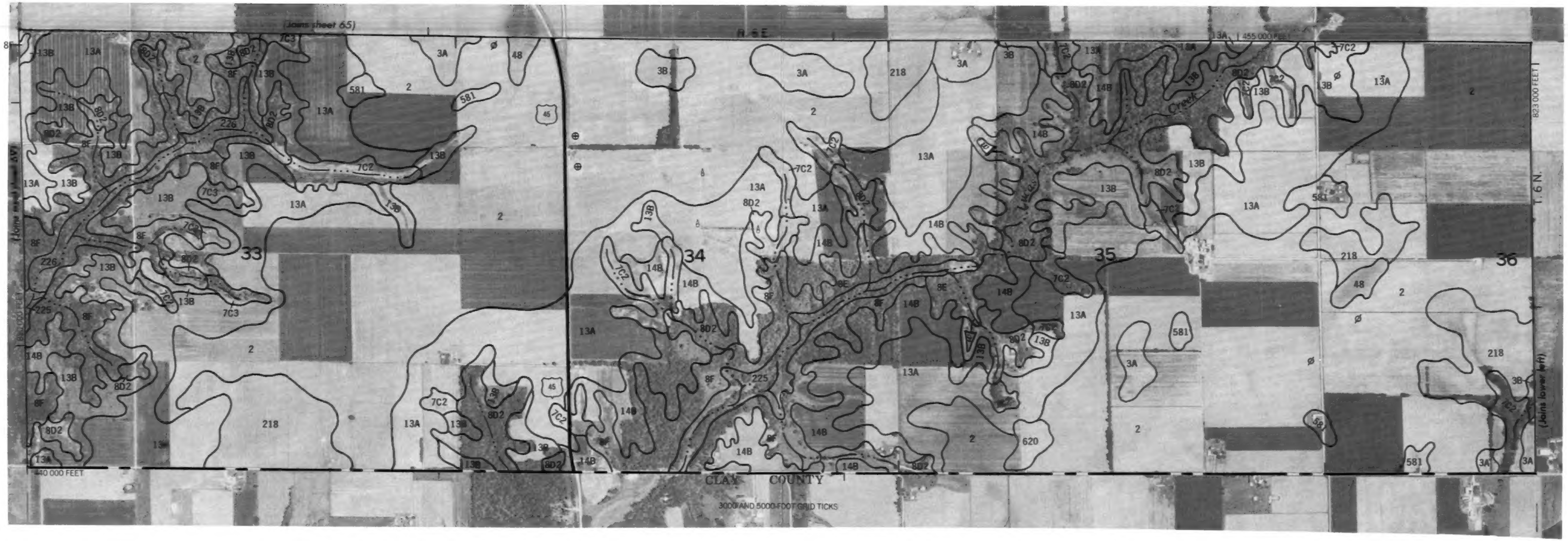
1 MILE

1 KILOMETER

Scale 1:15 840

0 1/4 1/2 3/4 1

0 0.5 1



2000 AND 5000-FOOT GRID TICKS

This soil survey map is compiled on 1981 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

EFFINGHAM COUNTY, ILLINOIS NO. 70

EFFINGHAM COUNTY, ILLINOIS NO. 71

This soil survey map is compiled on 1981 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.